These are the major points that I'd like to touch on.

Agenda

I'd like to share my group's philosophy with you because general framework forms a ~~basis~~ for guiding development

PHILOSOPHY

Harry Poster → **COMPARISONS TO 7854**

Extension from 7854
Successful product for 3yrs

MAJOR CHARACTERISTICS

Some primary Specs

HUMAN INTERFACE EXAMPLE

and then are examples of what to give a feel were thinking to make the ET Box easy to use

DESIGN CONCEPTS

How we plan to build the ET

Peter's Note: 7854
Last 2yrs 1472 units
Life (3yrs) 2500 units
W/O Calculator 4 units !

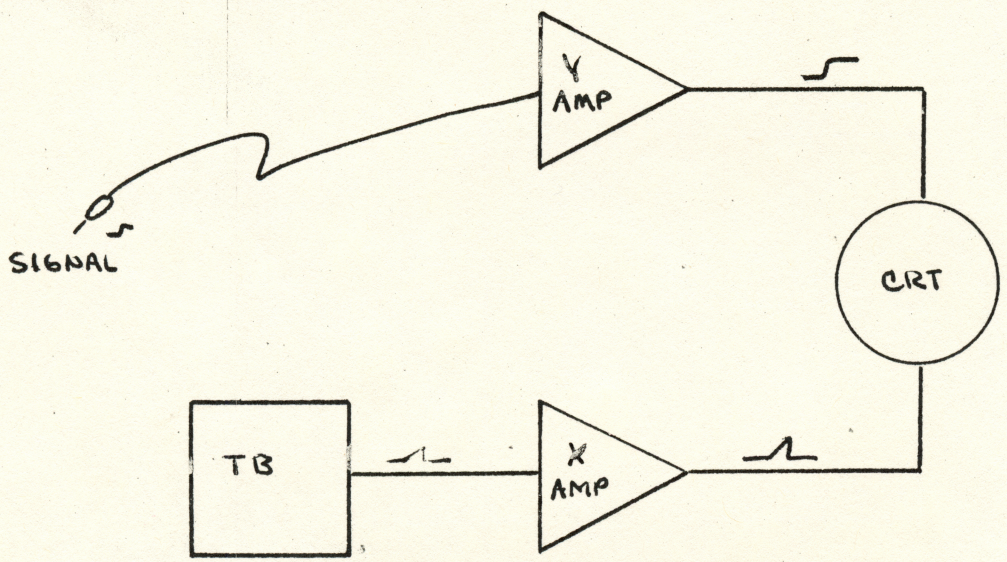
TR/hk (CPM/020/AGENDA)

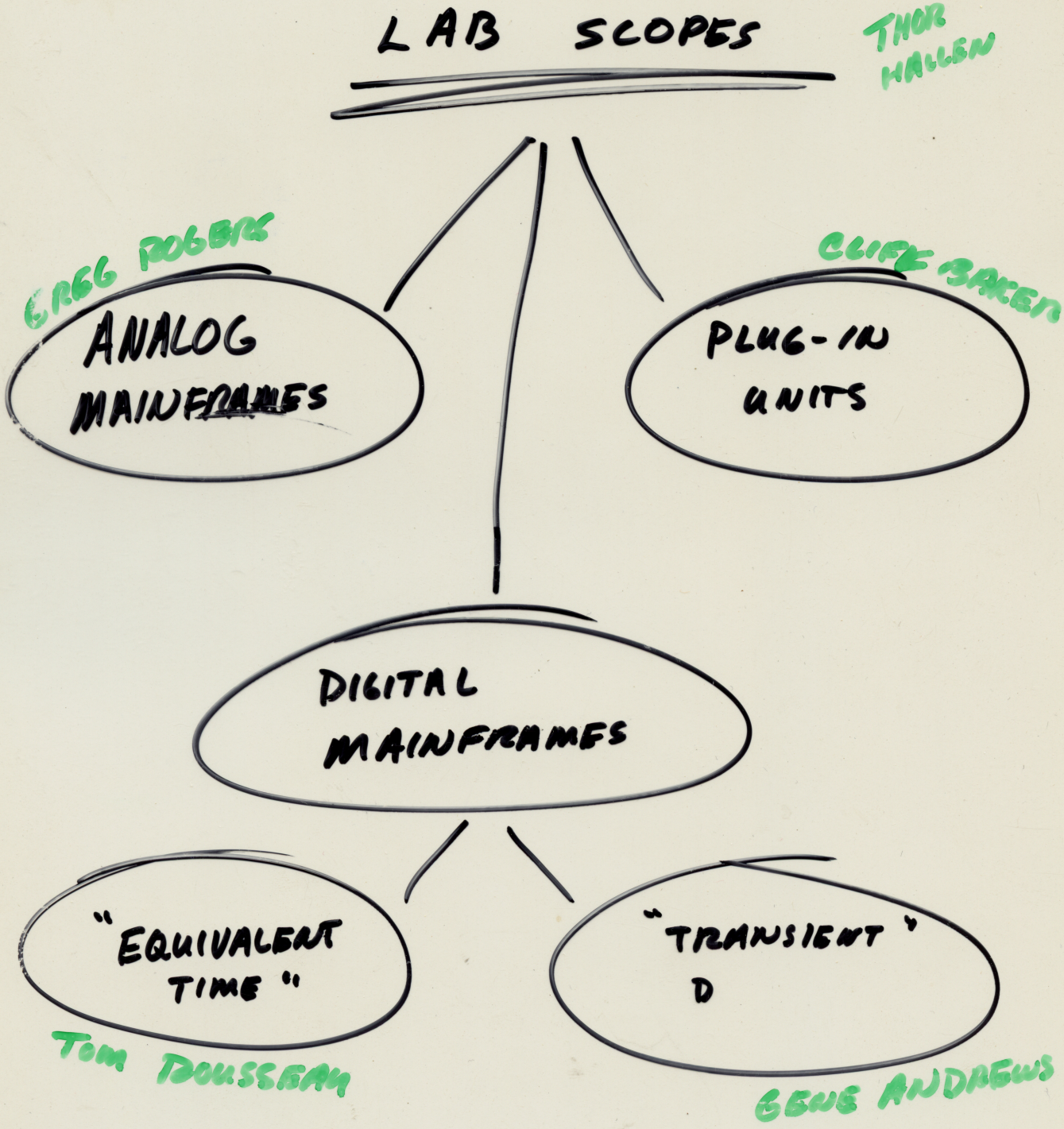
Agenda

	Time (min)
INTRODUCTION	1
DIGITAL SCOPES	2
ET PROGRAM	2
PROJECT DESCRIPTION	18
CRITICAL COMPONENTS	4
QUESTIONS	3

TR/hk (CPM/125/DOGNPONY)

ANALOG SCOPE:




LAB SCOPES
THOR HALLEN
GREG ROBERTS
ANALOG MAINFRAMES
CLIFF BAKER
PLUG-IN UNITS
DIGITAL MAINFRAMES
"EQUIVALENT TIME"
TOM DOUSSEAU
"TRANSIENT" D
GENE ANDREWS

26 July 93

7853DP DIGITAL OSCILLOSCOPE

"EQUIVALENT TIME" MAINFRAME

GENERAL DESCRIPTION

The 7853DP is a digital oscilloscope offering many features which make it a versatile instrument for general purpose waveform measurements:

* Digital-only design (without HF analog display path) provides significantly improved measurement accuracy and flexibility at a much lower cost, when compared to conventional scopes.

* 20 MS/s, 10 bit, 500 MHz digitizer satisfies most general purpose needs.

* "Live" operation for normal scope-like viewing of signals.

* "Storage" operation for retention and recall of signals.

* Friendly manual operation from the front panel.

* 100% functionally programmable for complete remote control of all functions and controls (ideal for system applications).

* High speed data and control I/O ports, including IEEE-488 and RS-232C, with expansion capabilities to others.

* Extensive waveform parameter measurement and processing functions for accurate and repeatable answers.

* Signal Averaging and Envelope acquisition capabilities.

* User selectable Auto-ranging feature simplifies operation, allowing the user to focus attention on the measurements rather than driving the scope.

* Automatic Self-cal (internal time/temp algorithm) for high accuracy measurements...even from a cold start.

* Soft-labeled functions significantly reduce front panel clutter and simplify operation...for the novice and expert alike.

26 July 83

Changes of June 84

7853DP DIGITAL OSCILLOSCOPE

"EQUIVALENT TIME" MAINFRAME

GENERAL DESCRIPTION

The 7853DP is a digital oscilloscope offering many features which make it a versatile instrument for general purpose waveform measurements:

* Digital-only design (without HF analog display path) provides significantly improved measurement accuracy and flexibility at a much lower cost, when compared to conventional scopes.

* 20 MS/s, 10 bit, 500 MHz digitizer satisfies most general purpose needs.

* "Live" operation for normal scope-like viewing of signals.

* "Storage" operation for retention and recall of signals.

* Friendly manual operation from the front panel.

* 100% functionally programmable for complete remote control of all functions and controls (ideal for system applications).

* High speed data and control I/O ports, including IEEE-488 and RS-232C, with expansion capabilities to others.

* Extensive waveform parameter measurement and processing functions for accurate and repeatable answers.

* Signal Averaging and Envelope acquisition capabilities.

* User selectable Auto-ranging feature simplifies operation, allowing the user to focus attention on the measurements rather than driving the scope.

* Automatic Self-cal (internal time/temp algorithm) for high accuracy measurements...even from a cold start.

* Soft-labeled functions significantly reduce front panel clutter and simplify operation...for the novice and expert alike.

* Three hardware plug-in compartments allow the user to configure the acquisition front-end for specific measurements (LEFT and RIGHT for vertical signals, and AUX for trigger conditioning as well as vertical signals); these compartments also allow for possible future analog/digital special purpose plug-ins.

* Two software plug-in compartments allow the user to add more measurement/processing power as Tek develops new applications (ROM-Paks).

* Built-in timebases for improved accuracy.

* Modular construction of both hardware and software means the scope never becomes obsolete, since the basic mainframe can be added to or updated as technology evolves (specifically applies to the digitizer, display, and measurement/processing capabilities).

* Hardcopy and Mass Storage capabilities when coupled to appropriate external devices via one of the I/O ports.

* Simplified construction techniques for ease of manufacture and high reliability.

* Fully compatible with 7K+ plug-ins; limited compatibility with selected 7K plug-ins when equiped with downgrade option.

* Three hardware plug-in compartments allow the user to configure the acquisition front-end for specific measurements (LEFT and RIGHT for vertical signals, and AUX for trigger conditioning as well as vertical signals); these compartments also allow for possible future analog/digital special purpose plug-ins.

* Two software plug-in compartments allow the user to add more measurement/processing power as Tek develops new applications (ROM-Paks).

* Built-in timebases for improved accuracy.

* Modular construction of both hardware and software means the scope never becomes obsolete, since the basic mainframe can be added to or updated as technology evolves (specifically applies to the digitizer, display, and measurement/processing capabilities).

* Hardcopy and Mass Storage capabilities when coupled to appropriate external devices via one of the I/O ports.

* Simplified construction techniques for ease of manufacture and high reliability.

* Fully compatible with 7K+ plug-ins; limited compatibility with selected 7K plug-ins when equiped with downgrade option.

CHARACTERISTICS:

Signal Acquisition:

Sampling Rate:	20MS/s.
A/D Resolution:	10 bits.
Equivalent Time Bandwidth:	500 MHz, mainframe only. 300 MHz, with popular plug-in.
Equivalent Time Transient Response:	700 ps risetime with less than 3% aberrations, mainframe only.
Vertical Accuracy:	0.4% DC to 1 MHz, 1.4% 1 MHz to 30 Mhz, mainframe only.
Analog Input Channels:	Three plug-in compartments, all equivalent (allows for up to 12 input channels with 4-trace plug-ins).
Record Length:	501 points to 10,001 points, user selectable in a 1-2-5 sequence.
Timebases:	Two identical built-in timebases allow for independent or delaying/delayed operation; input BNC provided for external source.
Record Duration:	5 ns to 1000 s. user selectable in a 1-2-5 sequence (no variable timebase).
Timebase Accuracy:	0.01%.
Acquisition Memory:	1001 points standard, optionally expandable to ~~10,001~~ 16K points.
Trigger:	Allows viewing/storage of signals, + to - 100% of the trigger point.
Trigger Source:	Any plug-in compartment (A13/B13) or external BNC.

CHARACTERISTICS:

Signal Acquisition:

Sampling Rate:	20MS/s.
A/D Resolution:	10 bits.
Equivalent Time Bandwidth:	500 MHz, mainframe only. 300 MHz, with popular plug-in.
Equivalent Time Transient Response:	700 ps risetime with less than 3% aberrations, mainframe only.
Vertical Accuracy:	0.4% DC to 1 MHz, 1.4% 1 MHz to 30 Mhz, mainframe only.
Analog Input Channels:	Three plug-in compartments, all equivalent (allows for up to 12 input channels with 4-trace plug-ins).
Record Length:	501 points to 10,001 points, user selectable in a 1-2-5 sequence.
Timebases:	Two identical built-in timebases allow for independent or delaying/delayed operation; input BNC provided for external source.
Record Duration:	5 ns to 1000 s, user selectable in a 1-2-5 sequence (no variable timebase).
Timebase Accuracy:	0.01%.
Acquisition Memory:	1001 points standard, optionally expandable to 10,001 points.
Trigger:	Allows viewing/storage of signals, + to - 100% of the trigger point.
Trigger Source:	Any plug-in compartment (A13/B13) or external BNC.

Display:

CRT:	4.3 inch (Horiz) x 5.3 inch (Vert) useable display area, monochrome, P-31 phosphor, crisp spot, electromagnetically deflected.
Technique:	Vertical Raster Scan, non-interlaced; bit-mapped static display with vertical scan dynamic display; 550 horiz by 704 vert pixels.
Color:	Not available on base product at initial introduction. Architecture allows for LCCS or shadow mask color to be added later, though technical problems remain to be solved in either case.
Intensity:	Four programmable levels: off, low, med, high.
Scanning Freq:	36.6 kHz horiz, 60 Hz vert.
Composite Video:	Available option; odd ball rate, workable with Tek 690SR.
Display Modes:	Waveform, Program, Help, Status, Utilities,...
Characters:	7 x 12 dot matrix; 55 characters per row, 44 rows; full ASCII set plus Tek specials.
Waveforms:	Fixed display at ~~501~~ 512 points per waveform (other resolution records are compressed/expanded for display purposes only...retain full resoulution in main memory); maximum of 8 waveforms displayed at a time; X-Y and Y-T
Graticule:	Electronic; linear ~~and log~~ standard (others available as option...as market applications are identified)

Display:

CRT:	4.3 inch (Horiz) x 5.3 inch (Vert) useable display area, monochrome, P-31 phosphor, crisp spot, electromagnetically deflected.
Technique:	Vertical Raster Scan, non-interlaced; bit-mapped static display with vertical scan dynamic display; 550 horiz by 704 vert pixels.
Color:	Not available on base product at initial introduction. Architecture allows for LCCS or shadow mask color to be added later, though technical problems remain to be solved in either case.
Intensity:	Four programmable levels: off, low, med, high.
Scanning Freq:	36.6 kHz horiz, 60 Hz vert. reversed
Composite Video:	Available option; odd ball rate, workable with Tek 690SR.
Display Modes:	Waveform, Program, Help, Status, Utilities,...
Characters:	7 x 12 dot matrix; 55 characters per row, 44 rows; full ASCII set plus Tek specials.
Waveforms:	Fixed display at 501 points per waveform (other resolution records are compressed/expanded for display purposes only...retain full resoulution in main memory); maximum of 8 waveforms displayed at a time; X-Y and Y-T
Graticule:	Electronic; linear and log standard (others available as option...as market applications are identified)

Storage:

Waveform Memory:	~~10,001~~ ~50k points standard, optionally expandable to ~~50,001~~ ~220k points.
"Front Panel" Set-ups:	10 configurations, maximum (internally).
~~Programs:~~	~~Up to 1000 commands (internally).~~
Power down:	~~All waveforms, programs,~~ configuration and front panel settings are retained for two weeks or more.
Mass Storage:	External, for waveforms, panel set-ups, ~~programs.~~ on PC

Waveform Processing:

Cursors:	One or two per waveform, absolute or relative measuring.
Acquisition:	Average, Envelope, Ground, Readout.
Waveform Parameters:	Amplitude: Max, Min, P-P, RMS, Mean, Mid; Pulse: Rise, Fall, Width, Delay, Freq, Per, Energy, Area.
Waveform Functions:	Diff, Integ, Interp, Smooth.
Arithmetic Operators:	+, -, /, *, Sqrt, Log, Exp, Abs, Sin, Cos, Signum.
Numeric Entry:	0 thru 9, . , exponent, change sign.
~~Alpha Entry:~~	~~A thru Z, upper and lower case.~~

Storage:

Waveform Memory:	10,001 points standard, optionally expandable to 50,001 points.
"Front Panel" Set-ups:	10 configurations, maximum (internally).
Programs:	Up to 1000 commands (internally).
Power down:	All waveforms, programs, configuration and front panel settings are retained for two weeks or more.
Mass Storage:	External, for waveforms, panel set-ups, programs.

Waveform Processing:

Cursors:	One or two per waveform, absolute or relative measuring.
Acquisition:	Average, Envelope, Ground, Readout.
Waveform Parameters:	Amplitude: Max, Min, P-P, RMS, Mean, Mid; Pulse: Rise, Fall, Width, Delay, Freq, Per, Energy, Area.
Waveform Functions:	Diff, Integ, Interp, Smooth.
Arithmetic Operators:	+, -, /, *, Sqrt, Log, Exp, Abs, Sin, Cos, Signum.
Numeric Entry:	0 thru 9, . , exponent, change sign.
Alpha Entry:	A thru Z, upper and lower case.

Programming:	Simple sequences of linked commands can be programmed to be associated with each waveform; complex programs require external optional Waveform Programmer keyboard.

Other:

Plug-in compatibility:	Fully compatible with all programmable 7K+ plug-ins; downward compatible with selected 7K plug-ins when equiped with optional downgrade kit: 7D20, 7A15A, 7A16A, 7A18A, 7A26, 7A17, 7A13, 7A22, 7A11, 7A24, 7A19, 7A29, 7S11, 7T11, 7M11, 7S12, 7S14, 7L14, 7L18, 7L5, 7L12, 7K11 (non-programmable).
Power:	110/220 VAC, 50/60 Hz; 400 Hz operation with fan option. 315 ~~300~~ Watts maximum line, fully loaded mainframe under worst case load conditions.
Size:	8.75 (H) x 16.75 (W) x 20 (D) cubic inches (bench); 8.75 (H) x 19.00 (W) x 20 (D) cubic inches (rack).
Reliability:	10,000 Hrs MTBF at 25^C, mainframe only.
Hardcopy:	Device drivers optional for output to specified hardcopy units via standard Centronics interface (possibly a Tek ink-jet copier with Tek interface will be amongst the offerings...from Wilsonville)

Programming:	Simple sequences of linked commands can be programmed to be associated with each waveform; complex programs require external optional Waveform Programmer keyboard.

Other:

Plug-in compatibility:	Fully compatible with all programmable 7K+ plug-ins; downward compatible with selected 7K plug-ins when equiped with optional downgrade kit: 7D20, 7A15A, 7A16A, 7A18A, 7A26, 7A17, 7A13, 7A22, 7A11, 7A24, 7A19, 7A29, 7S11, 7T11, 7M11, 7S12, 7S14, 7L14, 7L18, 7L5, 7L12, 7K11 (non-programmable).
Power:	110/220 VAC, 50/60 Hz; 400 Hz operation with fan option. 300 Watts maximum line, fully loaded mainframe under worst case load conditions.
Size:	8.75 (H) x 16.75 (W) x 20 (D) cubic inches (bench); 8.75 (H) x 19.00 (W) x 20 (D) cubic inches (rack).
Reliability:	10,000 Hrs MTBF at 25^C, mainframe only.
Hardcopy:	Device drivers optional for output to specified hardcopy units via standard Centronics interface (possibly a Tek ink-jet copier with Tek interface will be amongst the offerings...from Wilsonville)

PC

Mass Storage:	Device drivers optional to interface with specified mass storage units via GPIB port (possibly a Tek dual floppy drive unit with Tek interface...from Wilsonville)
Self-cal:	Invoked automatically to present settings whenever time and/or temperature change beyond specified limits, or when a setting is changed. Total self-cal time is less than 100 ms. Mainframe controls process, calibrating mainframe and plug-in DC balances, offsets, and low frequency gains.
Auto-ranging:	At the users selection, provides automatic ranging of acquisition vertical and/or horizontal scale factors, and/or triggering.

Options:

Waveform Programmer Keyboard:	Extends programming capability from simple linked sequences to complex programs.
Expansion Acquisition Memory:	Extends digitizer to 5001 or 10,001 points. 16K
Main Memory:	Extends waveform storage to 20,001 or 50,001 points. ~50K ~220K
Device Drivers:	Disk driver for xxxx model disk drive unit(s), via GPIB and/or proprietary ports. Printer driver(s) xxxx for model hardcopy unit(s), via Centronics port.

Mass Storage:	Device drivers optional to interface with specified mass storage units via GPIB port (possibly a Tek dual floppy drive unit with Tek interface...from Wilsonville)
Self-cal:	Invoked automatically to present settings whenever time and/or temperature change beyond specified limits, or when a setting is changed. Total self-cal time is less than 100 ms. Mainframe controls process, calibrating mainframe and plug-in DC balances, offsets, and low frequency gains.
Auto-ranging:	At the users selection, provides automatic ranging of acquisition vertical and/or horizontal scale factors, and/or triggering.

Options:

Waveform Programmer Keyboard:	Extends programming capability from simple linked sequences to complex programs.
Expansion Acquisition Memory:	Extends digitizer to 5001 or 10,001 points.
Main Memory:	Extends waveform storage to 20,001 or 50,001 points.
Device Drivers:	Disk driver for xxxx model disk drive unit(s), via GPIB and/or proprietary ports. Printer driver(s) xxxx for model hardcopy unit(s), via Centronics port.

Color:	Adds 3 or 8 color display (LCCS and/or shadow mask). (Not available at product introduction. ~~Will~~ MAY be developed as separate engineering project).
~~Rom Paks:~~	~~Mass Storage and Hardcopy Drivers. Amplifier gain correction. New Applications, as determined by our market needs.~~
Option ROMs:	~~Mass Storage and~~ Hardcopy Drivers.
Plug-in Downgrade:	Provides limited compatibility with selected 7K plug-ins.
~~400 Hz Fan:~~	~~Substitutes 50/60 Hz fan with 400 Hz fan.~~

Color:	Adds 3 or 8 color display (LCCS and/or shadow mask). (Not available at product introduction. Will be developed as separate engineering project).
Rom Paks:	Mass Storage and Hardcopy Drivers. Amplifier gain correction. New Applications, as determined by our market needs.
Option ROMs:	Mass Storage and Hardcopy Drivers.
Plug-in Downgrade:	Provides limited compatibility with selected 7K plug-ins.
400 Hz Fan:	Substitutes 50/60 Hz fan with 400 Hz fan.

ET MAINFRAME: LIST OF DOCUMENTATION 17 Jul 84

	TITLE	CONTACT
1	7853DP Digital Oscilloscope General Description	Rousseau
2	Responsibilities (people)	Rousseau
3	External Specification	Fladstol
4	Hardware Specification	Fladstol
5	7853DP Oscilloscope Primer	Fladstol
6	7853DP Oscilloscope Measurement Techniques	Fladstol
7	7853DP FW Project Plan	Hinrichs
8	"C" Coding Standard	Austin
9	7853DP Display Controller HW/SW Interface Spec	Diehm
10	7853DP Memory Management Unit HW/SW Interface Spec	Gupta
11	7853DP Software Quality Assurance Plan	Hinrichs
12	7853DP Hardware Architecture Overview	Stanley
13	ET Frimware Architecture	Stanley
14	Operating System Functional Specification for the ET Digitizer Processor	Schakel
15	7853DP Executive Processor Prototype Firmware Spec	Batson
16	ET Mainframe Interrupt Controller HW/SW Interface Spec	Hastings
17	ET Standard I/O Board RS-232 Port HW/SW Interface Spec	Hastings
18	ET Mainframe SDI HW/SW Interface Spec	Hastings
19	ET Temperature Sensor and Tone Generator HW/SW Interface Spec	Hastings
20	ET Mainframe Programmable Interval Timer HW/SW Interface Spec	Hastings
21	ET Printer Port HW/SW Interface Spec	Hastings
22	ET User Input HW/SW Interface Spec	Hastings

TR/pc (ET-1/DOCUMENT)

Engineering recommends changes to the ET program in order to reduce risks and schedule slippages. The recommendations are:

* eliminate some product features;
* slightly increase engineering personnel, staged over the next year;
* clearly establish ET project priority;
* adjust target PSR to first quarter of FY 700.

Details of this recommendation and associated risks and contingencies follow.

Several alternatives were considered while working towards this recommendation. They were rejected primarily based on time to market, product viability and risks, although their discussion contributed to the final recommendation. These alternatives are summarized following the recommendation.

Please see Tom Rousseau for further information.

Engineering recommends changes to the ET program in order to reduce risks and schedule slippages. The recommendations are:

* eliminate some product features;
* slightly increase engineering personnel, staged over the next year;
* clearly establish ET project priority;
* adjust target PSR to first quarter of FY 700.

Details of this recommendation and associated risks and contingencies follow.

Several alternatives were considered while working towards this recommendation. They were rejected primarily based on time to market, product viability and risks, although their discussion contributed to the final recommendation. These alternatives are summarized following the recommendation.

Please see Tom Rousseau for further information.

RECOMMENDATIONS:

Features:

Eliminate instrument programming language and limit programming composite processing to one operator.

Eliminate dedicated mass storage capability.

Limit Auto-scope to be the same as the HP1980.

Limit Waveform Compressor performance to min/max display only.

Resources:

Add one HWE III/IV to Digitizer control/DAG circuit by the end of AP 502.

Add two SWE I/II at the beginning of SW coding stage, last quarter FY 500.

Support:

Establish ET priority relative to other projects to insure that ECBs, evaluation, prototype, and technician requirements are not in the critical path. Make corrective adjustments if they come into the critical path.

Schedule:

Target PSR is first quarter FY 700, with 50% confidence factor: second quarter FY 700, with 80% confidence factor.

Program will be managed to the following targets:

HDC	510
HPR	603
HER	609
FDC	513
FIR	608
FER	613
PSR	701

RECOMMENDATIONS:

Features: Eliminate instrument programming language and limit programming composite processing to one operator.

Eliminate dedicated mass storage capability.

Limit Auto-scope to be the same as the HP1980.

Limit Waveform Compressor performance to min/max display only.

Resources: Add one HWE III/IV to Digitizer control/DAG circuit by the end of AP 502.

Add two SWE I/II at the beginning of SW coding stage, last quarter FY 500.

Support: Establish ET priority relative to other projects to insure that ECBs, evaluation, prototype, and technician requirements are not in the critical path. Make corrective adjustments if they come into the critical path.

Schedule: Target PSR is first quarter FY 700, with 50% confidence factor; second quarter FY 700, with 80% confidence factor.

Program will be managed to the following targets:

HDC	510
HPR	603
HER	609
FDC	513
FIR	608
FER	613
PSR	701

DISCUSSION OF RECOMMENDATIONS:

Features: Elimination of programming language and mass storage reflect the change of attitude towards this requirement. In the instrument's target user environment, the pervasiveness of personal computers is expected to obviate the need for self-contained programming and mass storage. It is now expected that a user can more effectively have these capabilities via his pc connected to the ET via a GPIB or RS-232 port. This change in attitude requires that Marketing identify and support specific pc's.

Programming of composite functions has deminishing value with multiple operators. One operator allows for composite functions such as: "wfm1 * wfm2","wfm3 - wfm6","wfm3/5"

Elimination of these features very significantly reduces the SW specification and design task; these features are not well defined, nor were they expected to be for several months due to conflicts of expectations and manpower restrictions.

Auto-scope becomes a fairly small task if it is expected to have the same characteristics as the HP1980. Beyond this, Auto-scope becomes a difficult task to resolve due to conflicts of performance expectations.

Limiting the waveform compressor to min/max eliminates uncertainty about algorithms for a variety of "averaging" schemes. The situation is that the averaging schemes have several potential pitfalls which have not been sorted out; min/max has been built and demonstrated...it has no design problems. The only reason for considering averaging is that it potentially could provide a more pleasing display to the eye when in the compressed display mode. However, the latter point is somewhat moot, in that a user can avoid the compressed waveform mode by selecting horizontal scrolling.

DISCUSSION OF RECOMMENDATIONS:

Features: Elimination of programming language and mass storage reflect the change of attitude towards this requirement. In the instrument's target user environment, the pervasiveness of personal computers is expected to obviate the need for self-contained programming and mass storage. It is now expected that a user can more effectively have these capabilities via his pc connected to the ET via a GPIB or RS-232 port. This change in attitude requires that Marketing identify and support specific pc's.

Programming of composite functions has deminishing value with multiple operators. One operator allows for composite functions such as: "wfm1 * wfm2","wfm3 - wfm6","wfm3/5"

Elimination of these features very significantly reduces the SW specification and design task; these features are not well defined, nor were they expected to be for several months due to conflicts of expectations and manpower restrictions.

Auto-scope becomes a fairly small task if it is expected to have the same characteristics as the HP1980. Beyond this, Auto-scope becomes a difficult task to resolve due to conflicts of performance expectations.

Limiting the waveform compressor to min/max eliminates uncertainty about algorithms for a variety of "averaging" schemes. The situation is that the averaging schemes have several potential pitfalls which have not been sorted out; min/max has been built and demonstrated...it has no design problems. The only reason for considering averaging is that it potentially could provide a more pleasing display to the eye when in the compressed display mode. However, the latter point is somewhat moot, in that a user can avoid the compressed waveform mode by selecting horizontal scrolling.

DISCUSSION OF RECOMMENDATIONS (cont):

Resources:

Three people are added to critical path items.

The control logic and DAG gate array designs tasks were previously under estimated; combined, they are proving to be a two person job with only one person working on them.

The two software people coming on line just before the coding phase helps to reduce coding time in the waveform manager and operating system areas. These can be college hires. They are not needed nor wanted during the specification and design phases.

Support:

The revised schedules were established with the assumption that long ques would be avoided for ECBs. Most boards expected to go around 4-5 times before ER, except the Acquisition and Timebase boards at 7-8 times (due to critical analog circuits and interactions with new ICs).

The assumption was made that minor changes (eg, metal only) to ICs could go around within a month and major ones within three months.

If ET is judged to be high priority to management, then commensurate support is needed.

Schedule:

Confidence factor means a 50/50 chance, or 80/20 chance of occuring as stated. There is certainly a risk that we won't hit first quarter, though the chance that we will is reasonable. If all goes reasonably well, then we'll make it. If there are unexpectedly severe IC, or system integration problems (including SW, plug-ins, and Manufacturing) then slips may occur.

Scheduling does not include the impact of the HMOS problem (disappearing vendor...Tek). If a solid resoultion is not reached by the end of AP 501, then we can expect as much as a 2 for 1 slip until it is. We run the risk of having to start from scratch on the two HMOS parts.

DISCUSSION OF RECOMMENDATIONS (cont):

Resources: Three people are added to critical path items.

The control logic and DAG gate array designs tasks were previously under estimated; combined, they are proving to be a two person job with only one person working on them.

The two software people coming on line just before the coding phase helps to reduce coding time in the waveform manager and operating system areas. These can be college hires. They are not needed nor wanted during the specification and design phases.

Support: The revised schedules were established with the assumption that long ques would be avoided for ECBs. Most boards expected to go around 4-5 times before ER, except the Acquisition and Timebase boards at 7-8 times (due to critical analog circuits and interactions with new ICs).

The assumption was made that minor changes (eg, metal only) to ICs could go around within a month and major ones within three months.

If ET is judged to be high priority to management, then commensurate support is needed.

Schedule: Confidence factor means a 50/50 chance, or 80/20 chance of occuring as stated. There is certainly a risk that we won't hit first quarter, though the chance that we will is reasonable. If all goes reasonably well, then we'll make it. If there are unexpectedly severe IC, or system integration problems (including SW, plug-ins, and Manufacturing) then slips may occur.

Scheduling does not include the impact of the HMOS problem (disappearing vendor...Tek). If a solid resoultion is not reached by the end of AP 501, then we can expect as much as a 2 for 1 slip until it is. We run the risk of having to start from scratch on the two HMOS parts.

MAJOR RISKS AND CONTINGENCIES:

AREA	RISK	CONTINGENCIES
IC Turn around time	More than three go arounds. Longer than 3 months for a go around. Loss of HMOS increases dependencies on outside.	For Tek ICs, install Lab Scope IC champion in Bldg 59. Add experienced IC designers to ET team. Delay project.
Digitizer Performance	Difficulty achieving satisfactory Equivalent Time speed. Satiscaftory Sample and Hold Hybrid. Time Interpolator IC: performance and functionality on schedule.	Highly experienced engineers on parts; high priority in IC and Hybrid support areas. Reduce performance expectations.
Power/Cooling	Too much power = inadequate cooling.	Convert more TTL farms to VLSI. Higher CFM and noisier fan. Lower reliability expectations.
Human Interface	Unacceptable error rates. User acceptance.	Lower expectations. Redefine and delay project.
HW/SW Integration	Severe problems.	Delay project and/or lower performance expectations.
Mainframe/Plug-in Integration	Severe problems. Inadequate quantities of hardware, software, people to test.	Delay project and/or lower performance expectations.
Technicians	Lack of sufficient quality and quantity.	Engineers do work.
Prototype FW	Insufficient support for HW. Too much demand on SW group.	HW engineers write prototype code. Delay product and/or diagnostics code.
Thru-put performance "Live"	Too slow.	Depend more heavily on assebaly coding. Accept performance as is.
SW Evaluation	Insufficient resources.	Reduce expectations. More black box less White box testing.
SW Development Tools	Adequate C compiler not available in time. No toolsmith.	Convert to a VAX/VMS environment and use Intel tools. Purchase Intel MRM and several Series IV's.
Morale	Could become low under heavy project stress. Could create family problems for employees.	Provide extraordinary incentives with benifits shared by spouse and family.

MAJOR RISKS AND CONTINGENCIES:

AREA	RISK	CONTINGENCIES
IC Turn around time	More than three go arounds. Longer than 3 months for a go around. Loss of HMOS increases dependencies on outside.	For Tek ICs, install Lab Scope IC champion in Bldg 59. Add experienced IC designers to ET team. Delay project.
Digitizer Performance	Difficulty achieving satisfactory Equivalent Time speed. Satiscaftory Sample and Hold Hybrid. Time Interpolator IC: performance and functionality on schedule.	Highly experienced engineers on parts; high priority in IC and Hybrid support areas. Reduce performance expectations.
Power/Cooling	Too much power = inadequate cooling.	Convert more TTL farms to VLSI. Higher CFM and noisier fan. Lower reliability expectations.
Human Interface	Unacceptable error rates. User acceptance.	Lower expectations. Redefine and delay project.
HW/SW Integration	Severe problems.	Delay project and/or lower performance expectations.
Mainframe/Plug-in Integration	Severe problems. Inadequate quantities of hardware, software, people to test.	Delay project and/or lower performance expectations.
Technicians	Lack of sufficient quality and quantity.	Engineers do work.
Prototype FW	Insufficient support for HW. Too much demand on SW group.	HW engineers write prototype code. Delay product and/or diagnostics code.
Thru-put performance "Live"	Too slow.	Depend more heavily on assebmly coding. Accept performance as is.
SW Evaluation	Insufficient resources.	Reduce expectations. More black box less White box testing.
SW Development Tools	Adequate C compiler not available in time. No toolsmith.	Convert to a VAX/VMS environment and use Intel tools. Purchase Intel NRM and several Series IV's.
Morale	Could become low under heavy project stress. Could create family problems for employees.	Provide extraordinary incentives with benifits shared by spouse and family.

ALTERNATIVES:

ALTERNATIVE	FEATURES	RESOURCES	TIME	CONFIDENCE	COMMENTS
#1 So called "Optimum" ET	Full feature set as described 2 Jun 84.	No additional engineers.	PSR AP 710	80%	Unacceptable because takes too long.
#2	Same as #1.	Add 3 engineers, 1 Digitizer, 2 SW	PSR AP 706	65%	Unacceptable because takes too long.
#3 First Quarter Plan	Eliminate programming; simple autoscope	Add 3 engineers, 1 Digitizer, 2 SW	PSR 1st Qtr FY 700 PSR 2nd Qtr FY 700	50% 80%	Requires clear project priority. This is the recommendation.
#4 "Minimum" DSO	Digital Storage & Display; not extensible; no programming or measurements		PSR AP 610	20-80%	Major project reset. Likely loose key people. Would still take longer than #3.
#5 Add digitizer to RT	Same as RT with 7854 style digitizer; No live digital dsy; No processing.	Same as RT + 4	PSR 613	40-70%	Requires ET Sample and Hold; not much enhancement over 7854. Very expensive.
#6 7854 Upgrade	Same as 7854 with functional programability added.	5 engineers	PSR 610	80%	Not much product enhancement over 7854; Very expensive ($7K mf + 1.5K per plug). Only dual trace, no delayed swp.

NOTES:

Given that shortest time to market is important, alternative #3 is viewed as the minimum risk. All others, except #6, are expected to either take longer or offer much less return for about the same time and effort. #6 does not provide a viable product to base our future on; at best, it is a stop gap product which would consume resources (about 13-15 people with support).

In the terms of #4, "minimum DSO", #3 is already the minimum we can do within time constraints. #4 would take longer for less product, due to being a major reset.

ALTERNATIVES:

ALTERNATIVE	FEATURES	RESOURCES	TIME	CONFIDENCE	COMMENTS
#1 So called "Optimum" ET	Full feature set as described 2 Jun 84.	No additional engineers.	PSR AP 710	80%	Unacceptable because takes too long.
#2	Same as #1.	Add 3 engineers, 1 Digitizer, 2 SW	PSR AP 706	65%	Unacceptable because takes too long.
#3 First Quarter Plan	Eliminate programming; simple autoscope	Add 3 engineers, 1 Digitizer, 2 SW	PSR 1st Qtr FY 700 PSR 2nd Qtr FY 700	50% 80%	Requires clear project priority. This is the recommendation.
#4 "Minimum" DSO	Digital Storage & Display; not extensible; no programming or measurements		PSR AP 610	20-80%	Major project reset. Likely loose key people. Would still take longer than #3.
#5 Add digitizer to RT	Same as RT with 7854 style digitizer; No live digital dsy; No processing.	Same as RT + 4	PSR 613	40-70%	Requires ET Sample and Hold; not much enhancement over 7854. Very expensive.
#6 7854 Upgrade	Same as 7854 with functional programability added.	5 engineers	PSR 610	80%	Not much product enhancement over 7854; Very expensive ($7K mf + 1.5K per plug). Only dual trace, no delayed swp.

NOTES:

Given that shortest time to market is important, alternative #3 is viewed as the minimum risk. All others, except #6, are expected to either take longer or offer much less return for about the same time and effort. #6 does not provide a viable product to base our future on; at best, it is a stop gap product which would consume resources (about 13-15 people with support).

In the terms of #4, "minimum DSO", #3 is already the minimum we can do within time constraints. #4 would take longer for less product, due to being a major reset.

NOTES:

PSR is the time Manufacturing is ready to output first products. PSR is not the same as customer availability, unless Marketing demo requirements are zero. CA will typically lag PSR by the amount of time required to fill demo requirements at the Manufacturing output rate.

TR/hk (CPM/130/RECOMEND.ET)

NOTES:

PSR is the time Manufacturing is ready to output first products. PSR is not the same as customer availability, unless Marketing demo requirements are zero. CA will typically lag PSR by the amount of time required to fill demo requirements at the Manufacturing output rate.

TR/hk (CPM/130/RECOMEND.ET)

IV. PHASED RELEASES.

It was decided that there would be three Phased Releases of the Produ Firmware, with the following schedule:

RELEASE		AREA	FEATURES
Release I	AP 605	DIG	All except Autocal, Autoscope, and limited set of plugins only.
		DSY	YT Waveforms; Lines; Graticules
		EXP HL	Menu processor; ASCII Parser
		EXP LL	O/S (minus some calls); Internal Comm; Extern Comm; 'Easier' GPIB
		HIM	Waveforms w/o windows; Major menus; Icons; Axes
		LLCmd	Simple waveforms (single wfm only); Parameter setting/changing
		DIAG	Self-test (Power-up)
		WFM MGR	To be determined
		GENERAL	Error detection, but no error recovery
Release II	AP 608	DIG	Autoscope; Autocal; Misc Plugins
		DSY	Recovery from temporary items (Popups); Everything else.
		EXP LL	Autocal; Autoscope; Touchscreen; RS232 Comm; 'Tricky' GPIB
		HIM	All else: Meters, Knobs, etc.
		LLCmd	Functions added to sources; multiple wfms; Cursors; Windows
		DIAG	Interactive diagnosis
		WFM MGR	To be determined
		GENERAL	Error Recovery
Release III	AP 610	EXP LL	Hard copy interface
		LLCmd	Vertical Source functions and Measurement commands; Error detection.
		WFM MGR	To be determined

Wendy Wanlass, M.D.
Internal Medicine
4855 S.W.
Western
Avenue
Beaverton,
Oregon
97005
503 643-7565

1
39
20
26
52
80
219 Knobs/buttons

1
44
20
30
58
115
267 Commands/functions

7854

2 knobs
38 Hard buttons
24 Status indicators

Transparent Touch Panel

Custom ICs

SH3	Quantizer Comparator Buffer/Multiplexer Time Interpolator
HMOS	Timebase Digitizer Control MMU Waveform Compressor
NEC CMOS	Vertical Raster Scan

Hybrids

Sampler
Buffer/Multiplexer

Color Shutter (Option)

TR/hk (CPM/125/RELTECH)

Critical Components

Transparent Touch Panel

Custom ICs

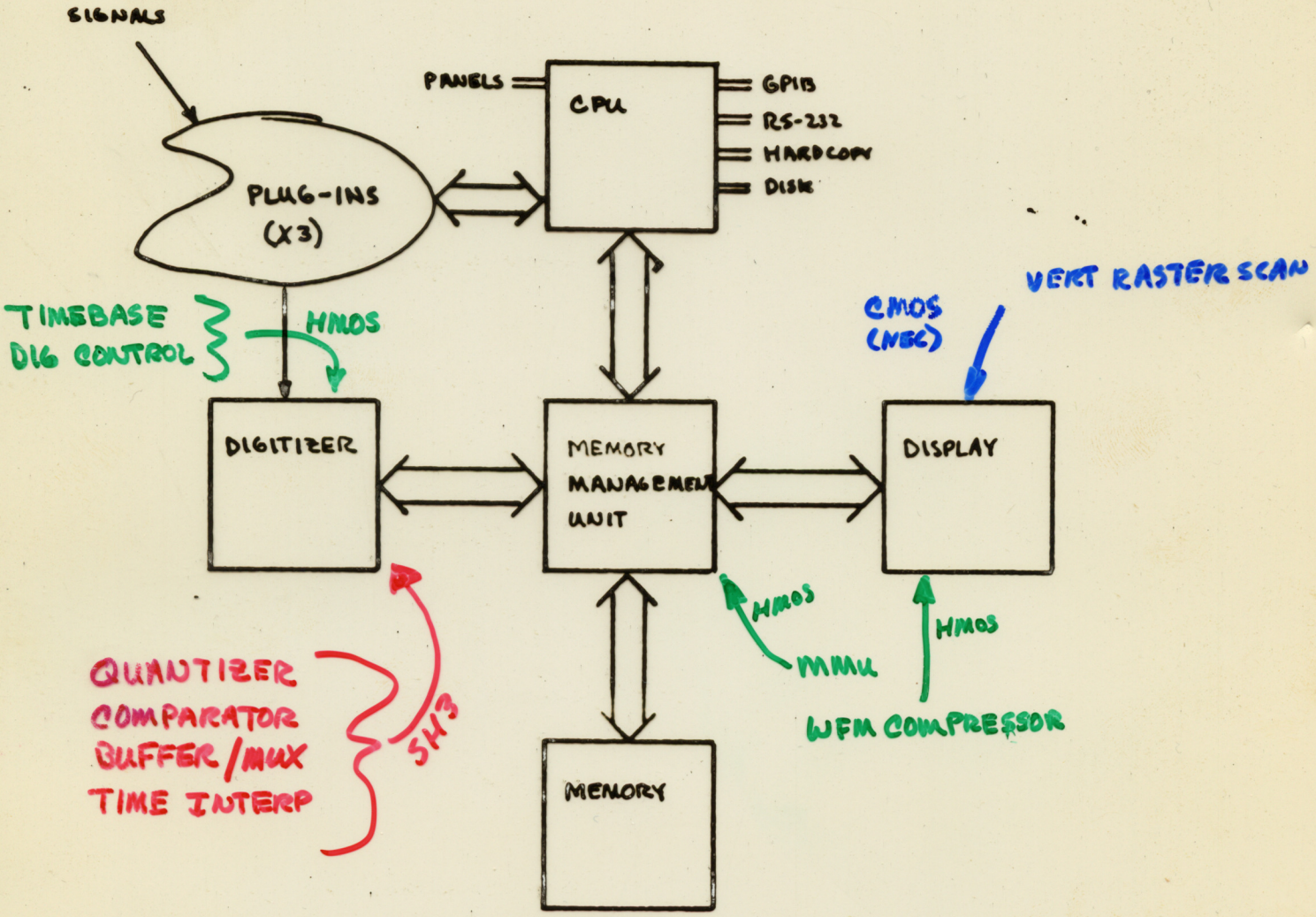
SHJ	Quantizer Comparator Buffer/Multiplexer Time Interpolator
HMOS	Timebase Digitizer Control MMU Waveform Compressor
NEC CMOS	Vertical Raster Scan

Hybrids Sampler
Buffer/Multiplexer

Color Shutter (Option)

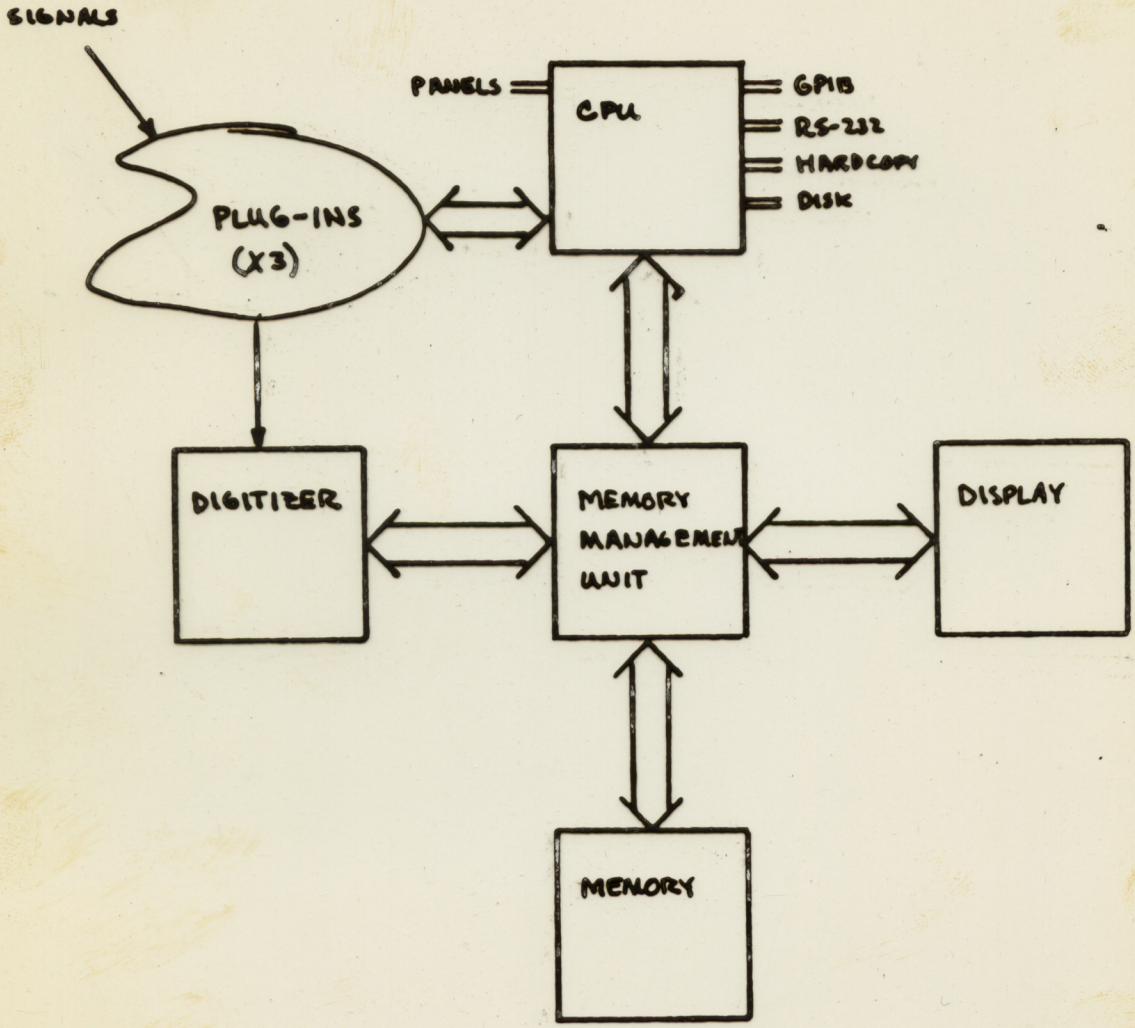
TR/hk (CPM/125/RELTECH)

Custom IC's & Hybrids



18 Oct 83
TR

Architecture



18 Oct 83
TR

- FOR THE USER:

  More Performance for the $

  - FLEXIBILITY TO ADAPT TO CURRENT/FUTURE NEEDS
    - * PLUG-INS (HW)
    - * OPTION ROMS (FW)
  - EASIER TO USE
  - ENHANCED MEASUREMENTS
    - * MORE ACCURATE
    - * FASTER
    - * AUTOMATED

25 JUL 85

- FOR TEKTRONIX:

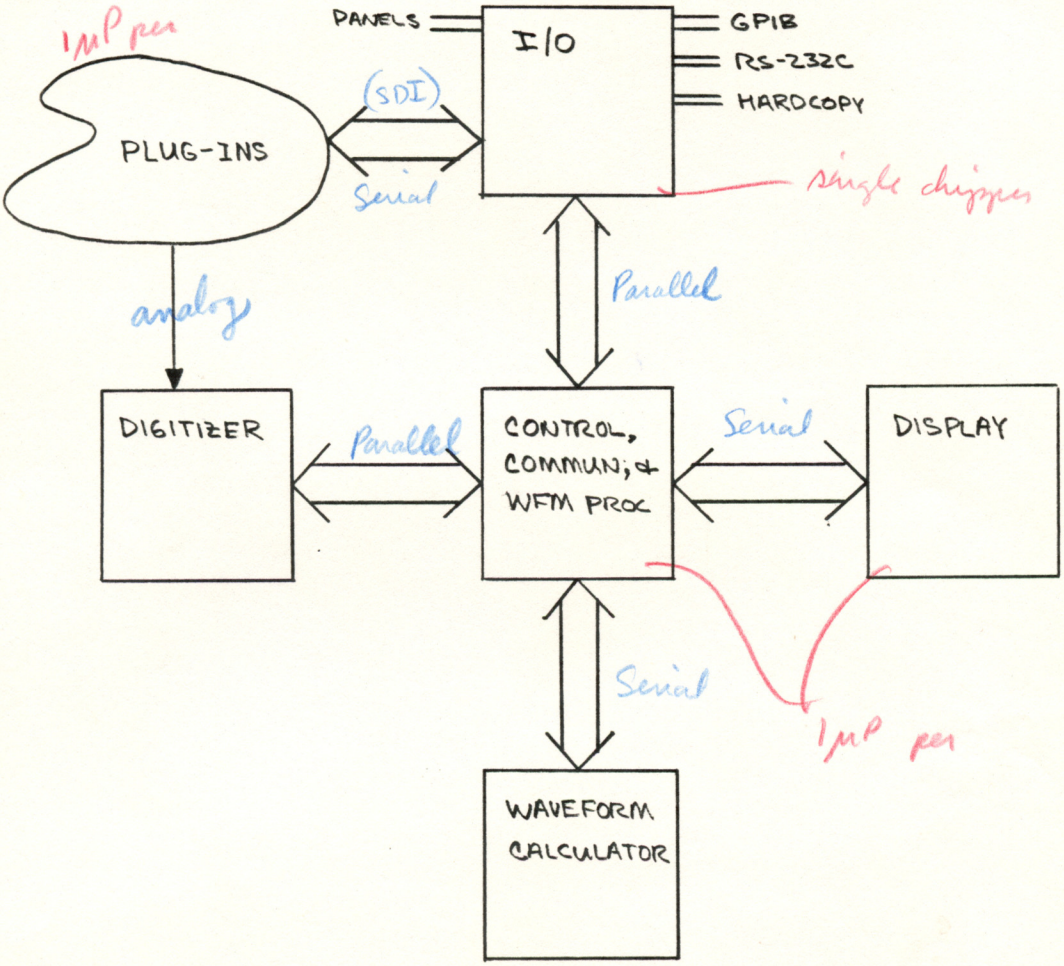
  New, Powerful, Flexible Architecture

  - COMPLETELY NEW
  - MODULAR HW & FW
  - MUCH GREATER FLEXIBILITY TO CONFIGURE NEW PRODUCTS
  - FASTER TIME TO MARKET FOR FUTURE PRODUCTS

  ⟹ Difficult Barrier for Competition to Overcome

25 JUL 85

Architecture



7854 Sales

I'm going to describe the ET mainframe for you.

Addressing the more sophisticated user who demands greater accuracy and efficiency with general measurements, but is still sensitive to cost.

It means our foremost goal is to provide the best balance of solutions to measurement problems.

Every feature we put into the box has real value ~~towards improving measurements~~.

The human interface is not precisely defined at this time, but we do have some general concepts thought out.

Our goal is to minimize the users concern with setting up the scope, allowing him to concentrate on his measurements, instead.

TEK INTER-OFFICE COMMUNICATION

LAB SCOPES PRESENTATION SCHEDULE

TO: Distribution List for Wed 19 Oct

DATE: Oct. 5, 1983

FROM: George Kersels

SUBJECT: Meeting Agenda

I have asked Thor Hallen of ISD to have his organization give us a presentation. The time, place and agenda are listed below. I would like everyone in ECO from 2nd level managers and up to plan to attend this session.

If you have any questions give Vikki (x5431) a call.

PLEASE CARPOOL WITH SOMEONE ELSE IF YOU POSSIBLY CAN... THEIR PARKING IS VERY MINIMAL

DATE: Wednesday
October 19th

TIME: 1:00pm - 5:00pm

PLACE: PGE Building (Auditorium)
Corner of Old Scholls Ferry Road
and Murry Blvd.

AGENDA:

1) Introductions - George Kersels (5 mins.)
2) ISD/Lab Instruments Engineering - Thor Hallen, Engr. Manager (10 mins.) go to the mgrs
3) Greg Rogers - Real Time Manager (30 mins.) Unique Features; TC's; SDM; MCP 600 MHz CPT
4) Break (15 mins.)
5) Tom Rousseau - Equivalent Time Manager (30 mins.) Human & Tek - examples Trade Panel; Color Shuttle; comments to family
6) Gene Andrews - Transient Mainframe Manager (30 mins.)
7) Break (15 mins.)
8) Cliff Baker - Next Generation Plug Ins Manager (15 mins.) read both LBT & Scan Conversion Notes/Pro benefits
9) Stu McNaughton - Current Generation Manager (30 mins.)
10) Questions/Answers/Discussion (30 mins.)

Distribution List
Chris Curtin
Fred Engstrom
Lisa Schultz
Aris Silzars
Wayne Spencer
Mike Swink

ECO Secretaries: NOTE: Please make sure this notice gets to the 2nd line managers and above.

TEK INTER-OFFICE COMMUNICATION

TO: Distribution DATE: February 2, 1983

FROM: Thor Hallen

SUBJECT: Change Of Schedules

Phil Robinson has requested the opportunity to provide feedback on our development plans, presented to him last week.

He will be available at the beginning of our presentation this Friday. We have moved the speaking schedule back 15 minues for his presentation.

8:15 - 8:30	Presentation by Phil Robinson
8:30 - 8:45	Introduction / Jim
8:45 - 9:15	Market Dynamics / Peter
9:15 - 9:30	Family Overview / Thor
9:30 - 10:00	Conventional Mainframes / Greg
10:00 - 10:30	E.T. Mainframes / Tom
10:30 - 10:45	BREAK - Coffee in cafeteria
10:45 - 11:15	T.D. Mainframes / Gene
11:15 - 11:30	Plug-Ins / Cliff
11:30 - 11:45	H.R. Sampling / Stu
11:45 - 12:00	Project Estimates / Thor (as needed)
12:00 - 12:15	Firmware Plan / Don (as needed)
12:15 - 12:45	Discussion / All

lcw

DISTRIBUTION: Jim Cavoretto

Peter Schot

Greg Rogers

Tom Rousseau

Gene Andrews

Cliff Baker

Stu McNaughton

Don Williams

Thor Hallen

TEK INTER-OFFICE COMMUNICATION

TO: Distribution DATE: February 2, 1983

FROM: Thor Hallen

SUBJECT: Reschedule of 7K+ Presentations to Lab Scopes Engineering

The Presentation on the 7K+ Family of Instruments has been moved:

DATE: February 4, 1983, Friday

TIME: 8:15 - 12:30

PLACE: PGE AUDITORIUM

(End of Murray Rd at Scholls Ferry Rd)

Please carpool from Tektronix, as PGE has limited parking space.

Below is the schedule of presentations:

8:15 - 8:30	Introduction / Jim
8:30 - 9:00	Market Dynamics / Peter
9:00 - 9:15	Family Overview / Thor
9:15 - 9:45	Conventional Mainframes / Greg
9:45 - 10:15	E.T. Mainframes / Tom
10:15 - 10:30	BREAK - Coffe in cafeteria
10:30 - 11:00	T.D. Mainframes / Gene
11:00 - 11:15	Plug-Ins / Cliff
11:15 - 11:30	H.R. Sampling / Stu
11:30 - 11:45	Project Estimates / Thor (as needed)
11:45 - 12:00	Firmware Plan / Don (as needed)
12:00 - 12:30	Discussion / All

The auditorium is booked until 1:00 in case of overflow.

lcw

DISTRIBUTION: Jim Cavoretto
Peter Schot
Greg Rogers
Tom Rousseau
Gene Andrews
Cliff Baker
Stu McNaughton
Don Williams
Thor Hallen

TEKTRONIX Inter-Office Communication

To: List Date: 1/21/83

Subject: Yesterday's Presentation to
Wim Velsink and Phil Robinson

Based on comments from Phil Robinson I would classify our presentation yesterday a success.

I know there are still a lot of unanswered questions but I think we have come a long way toward gaining the additional support from Phil and Wim that this program requires.

This doesn't mean the road is "clear ahead" from now on. Resources are, and will continue to be tight. But I'm sure we will be funded to a reasonable level.

So, let's get moving!!

Best Regards,

Jim Cavoretto
Business Unit General Manager
Laboratory Instruments

List: Thor Hallen, Gene Andrews, Tom Rousseau, Greg Rogers, Cliff Baker, Stu McNaughton, Don Williams, Peter Schot.

MANUFACTURING COST ESTIMATE

- ET Mainframe with Mono Display, 20/10 Dig, Waveform Calculator — $3600

  Color Option — ~$400

- Compares to 7854 — $4500

Based on FY300 Frozen standards

BREAKDOWN OF ET COST ESTIMATE:

	Parts + Non IDL
Digitizer	615
CPU	429
Display	417
Diagnostics	24
Auto-Cal	18
Option Hooks	24
Plug-in Interfacing	290
External keyboard	120
Mechanical Pkg	240
Power Supply	150
Front Panel	134
Other	406
SUB-TOTAL	2867
ISD Labor @ 20%	717
TOTAL	3584

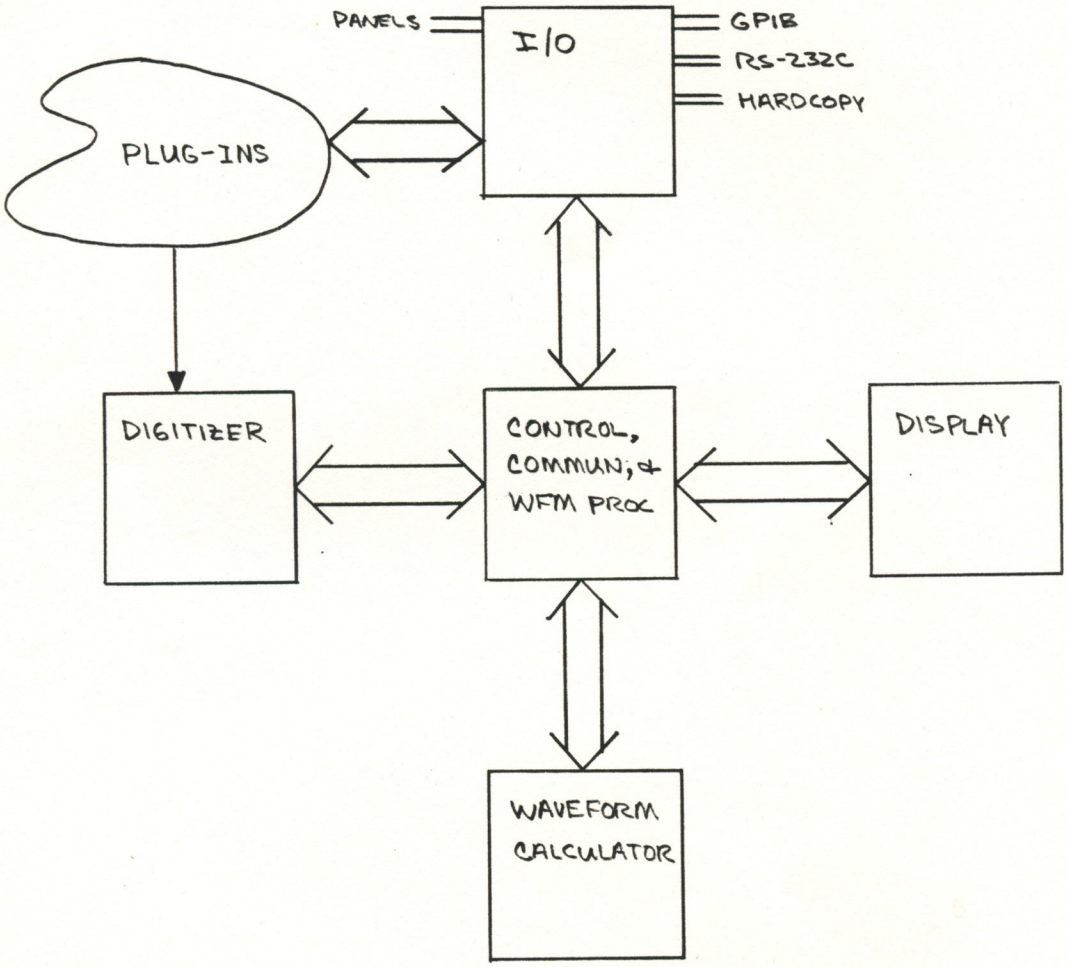
SHF III	Quantizer Comparator Sampler Buffer
HMOS	Custom Gate Arrays and IC's Digitizer Timebase and Control Display Vector Generator and Control

ITO Transparent Touch Keys

Color Shutter on high resolution raster display

Hybrids

TR/hk (CPM/020/RELTECH)


PANELS
I/O
GPIB
RS-232C
HARDCOPY
PLUG-INS
DIGITIZER
CONTROL, COMMUN, & WFM PROC
DISPLAY
WAVEFORM CALCULATOR

PHILOSOPHY

COMPARISONS TO 7854

MAJOR CHARACTERISTICS

HUMAN INTERFACE EXAMPLE

DESIGN CONCEPTS

TR/hk (CPM/020/AGENDA)

WE WANT...

TO MAKE THE WORLD'S BEST VALUED LABORATORY GRADE OSCILLOSCOPES FOR GENERAL WAVEFORM MEASUREMENTS.

TO THAT END...

WE WILL PROVIDE FEATURES WHICH CLEARLY AND DIRECTLY ENHANCE WAVEFORM MEASUREMENTS:

- INCREASE MEASUREMENT ACCURACY
- REDUCE INSTRUMENT IMPOSED COMPLEXITIES.

TR/hk (CPM/020/PHILOSOP)

ATTRIBUTE	7854	ET
WAVEFORM ACQUISITION	Integral A/D 250KS/s, 10 bit ET BW 475 MHz Linear Ramp TB	Modular A/D 20MS/s, 10 bit ET BW 475MHz Digital TB
DIGITAL STORAGE	5120 points, max 1024 pt, max rec	10,001 points, max 10,001 pt, max rec
MEASUREMENTS/ PROCESSING	Waveform Parameters Waveform Calculator	Waveform Parameters Waveform Calculator Extended Functions (via ROM Paks, I/O)

TR/hk (CPM/020/COMPARE1)

ATTRIBUTE	7854	ET
DISPLAY	Analog, DC-400MHz Digital (from memory only) Text 40 char, 16 lin 5 inch diagonal	Digital (from memory or continuous acquire - emulates realtime display) Text 50 char, 27 lines 7.5 inch diagonal Color Option
ACCURACY	2%, Vert & Horiz	<0.5%, Vert 0.02% or 20ps max, Horiz
FUNCTIONAL PROGRAMABILITY	Vert & Horiz Modes (MF only; nothing in plug-ins)	All functions, including plug-ins
I/O PORTS	GPIB	GPIB RS-232C Hardcopy Expandable

TR/hk (CPM/020/COMPARE2)

ATTRIBUTE	7854	ET
EASE OF USE		Fewer Controls Auto-Scope Thoughtful Menus
SELF-CAL	No	DC Gains, Offsets
DIAGNOSTICS	Extensive - external Simple PUP Self-test	Extensive - internal Complete PUP Self-test (reports specific failures; allows override)
MODULARITY	Plug-ins Memory Waveform Calculator Power Supply	Plug-ins Memory Waveform Calculator ROM-Paks Digitizer Display I/O Ports Power Supply
PHYSICAL	Upright, Bench only	Low-Profile, Bench & Rack
COST	$4500	$3600

TR/hk (CPM/020/COMPARE3)

20MS/s, 10 bit, 2-stage flash converter

475MHz ET BW (300MHz @ probe tip)

Adjustable Record Length to 10,001 points

1001 Standard; Option up to 10,001

Accuracies < 0.5% Vert, 0.02% or 20ps Horiz

Signal Averaging and Envelope acquisition modes

Continuous Acquire or Roll modes, with acquire stop

TR/hk (CPM/020/CHARACT1)

Waveform Parameters

Min, Max, P-P, RMS, Mean, Risetime, Falltime, Width, Freq, Period, Area, Cursors.

Waveform Calculator

Parameters
Functions (Diff, Intg, Interp, Smooth)
Operators (+, -, /, *, Sqrt, Log, Exp, Abs, Sin, Cos)
Programming linked sequences of commands

Opt ROMs or ROM Paks

Programming KCB

Extended Processing

FFT, Amplifier Error Correction, Hardcopy Driver, Special Applications

Opt Roms or Rom Paks

Display up to eight waveforms at one time

"Soft" key labeling

Text: ASCII and special Tek characters

50 characters per line, 27 lines

640 X 480 pixels

Electronic Graticule

Zooming, panning

Auto-scaling of display

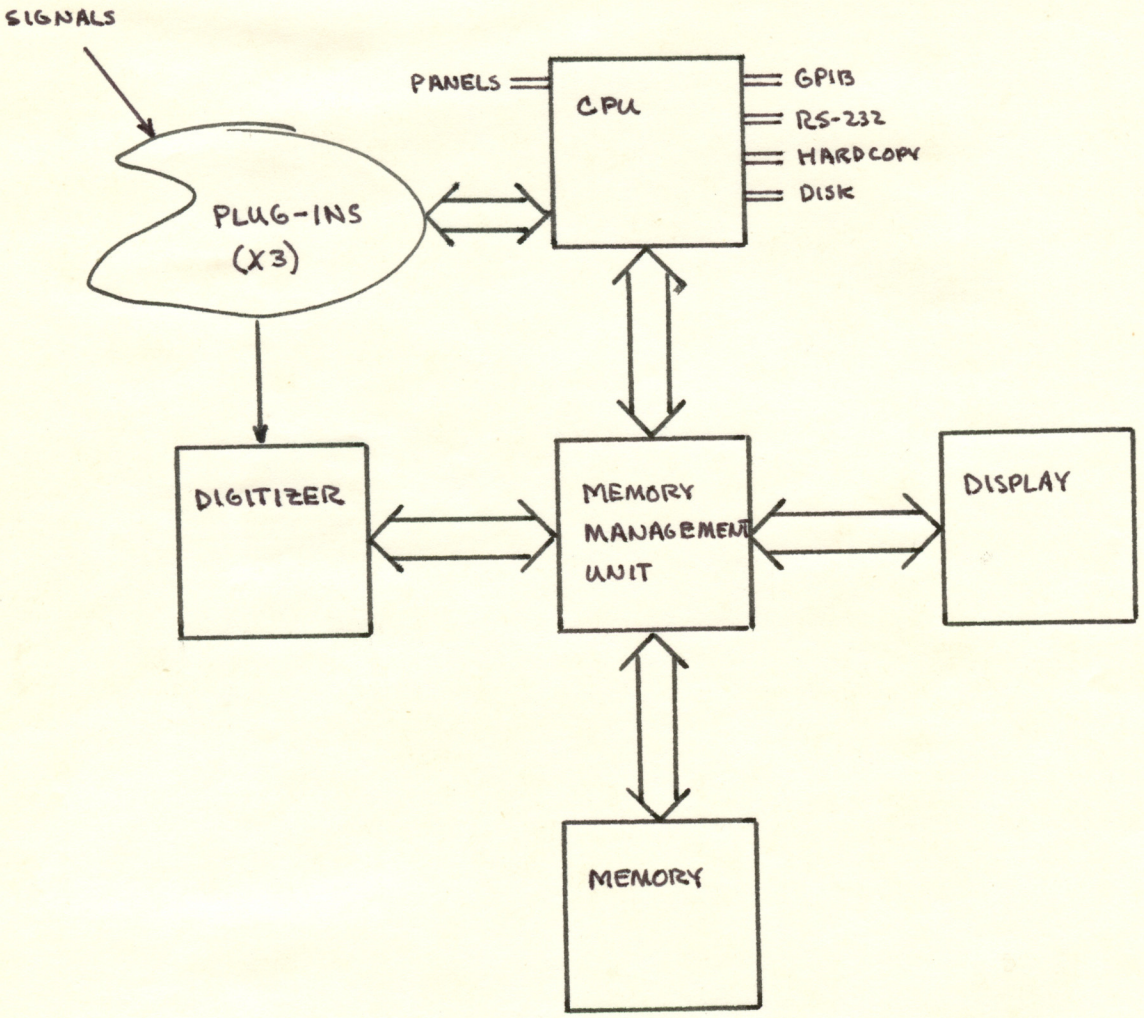
Continuous display of selected parameters

Color option (red, green, yellow) with shading

Normal and Reverse video

Interactive Display

TR/hk (CPM/020/CHARACT3)

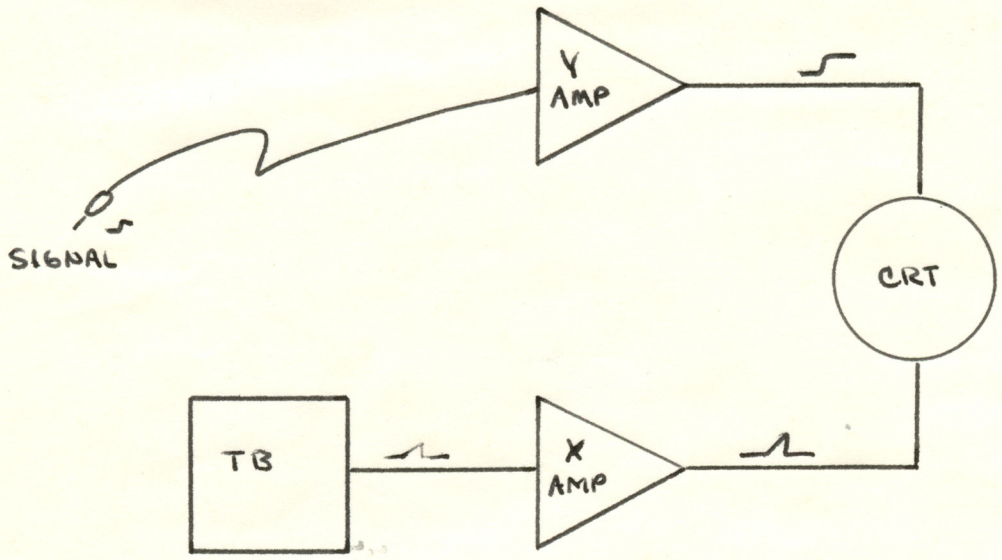


DIGITAL

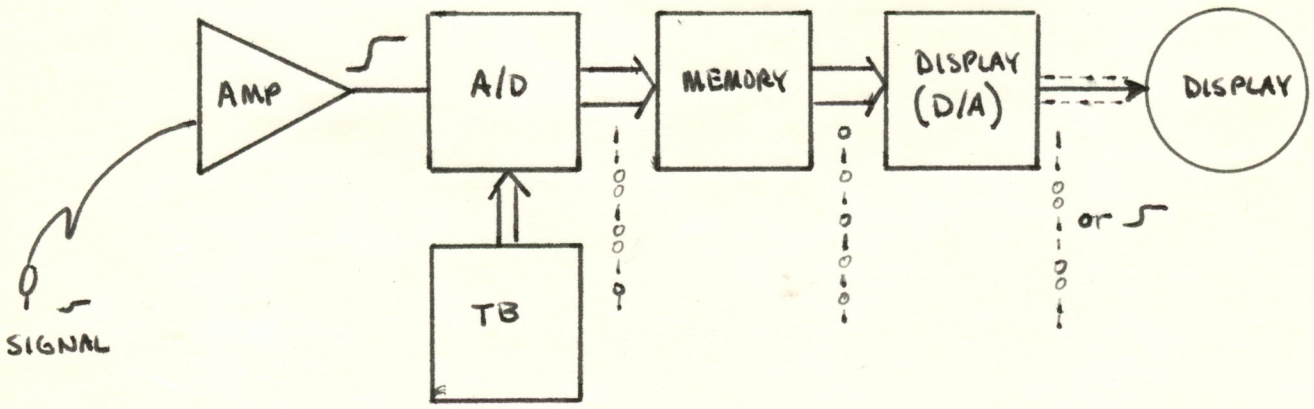
ANALOG

18 Oct 83
TR

ANALOG SCOPE:



DIGITAL SCOPE:



18 Oct 93
TR

INTRODUCTION

DIGITAL SCOPES

ET PROGRAM

PROJECT DESCRIPTION

CRITICAL COMPONENTS

TR/hk (CPM/125/DOGNPONY)

INTRODUCTION

DIGITAL SCOPES

ET PROGRAM

PROJECT DESCRIPTION

CRITICAL COMPONENTS

QUESTIONS

TR/hk (CPM/125/DOGNPONY)

DEVELOP SALABLE PRODUCTS

ET Mainframe (20 MS/s Digitizer)
100 MS/s Digitizer
Color Option
SW Applications

GET ET MAINFRAME TO MARKET BY AP 610

DEVELOP MODULAR ARCHITECTURE FOR DIGITAL SCOPES

UPGRADE 7K CAPABILITIES

Fully Programmable Hardware
Digital Data/Control Communications
Modular SW/FW
Simplified Human Interface

TR/hk (CPM/125/PRIMGOAL)

DEVELOP MODULAR ARCHITECTURE FOR 7K DIGITAL SCOPES

Design Flexibility
Manufacture Flexibility
Product Configuration Flexibility
SW and HW

IMPROVE AND EXTEND MEASUREMENT CAPABILITIES

Accuracy
Local Processing
Remote Control
SW Applications

SIMPLIFY THE HUMAN INTERFACE

Reduce Unnecessary Clutter
Friendly to the Neophyte
Effective for the Expert
Instrument should be Helpful

TR/hk (CPM/125/ETEFFORT)

Transparent Touch Panel

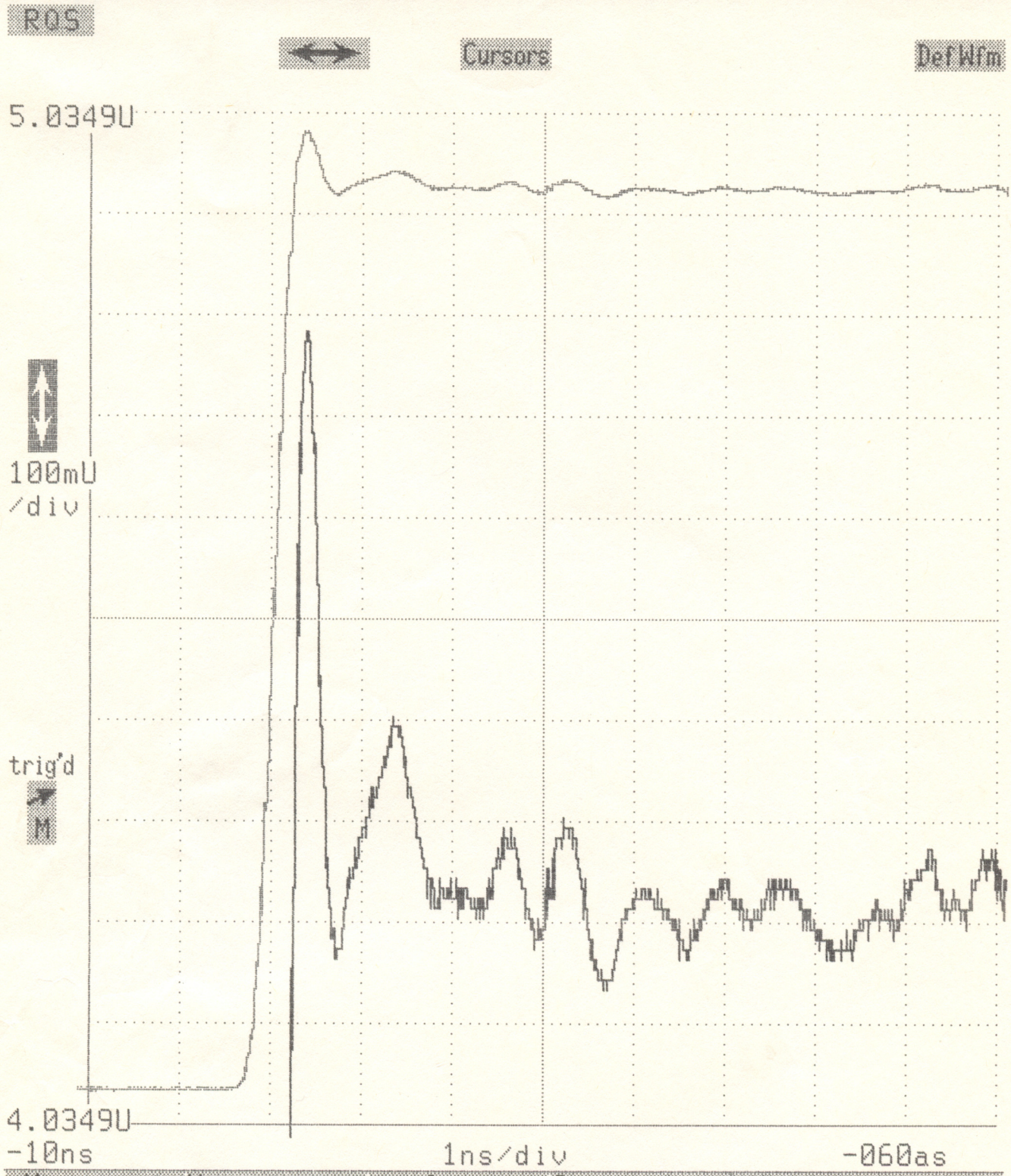
Custom ICs

SH3	Quantizer
	Comparator
	Buffer/Multiplexer
	Time Interpolator
HMOS	Timebase
	Digitizer Control
	MMU
	Waveform Compressor
NEC CMOS	Vertical Raster Scan

Hybrids	Sampler
	Buffer/Multiplexer

Color Shutter (Option)

TR/hk (CPM/125/RELTECH)



Vertical Desc	Horizontal Desc	Axes	Conditional Acquistion	Vert Mag: Wfm
				-------V/div
L+0	Main @1024 pts	Linear	Continuous	Vert Pos: Wfm
				-------V
Impedance	Coupling	BW Limit	Page to All Wfms Status	Remove Wfm 2 L+0 Main / Chan Sel Calcd Wfm

FIRMWARE BUDGET

DIAGNOSTICS	16K
WAVEFORM PROCESSING	32K
CONTROL + COMMUNICATIONS	4K
DISPLAY	16K
I/O	20K
DIGITIZER	4K
AUTOSCOPE	4K
AUTO CAL	4K
	100K

DEVELOPMENT SCHEDULE

PA	313
DC	409
ER	513
PSR	606

DEVELOPMENT COST

DC	$1.5M
PSR	4.1M