

clarify.one

hi tech :) job done right

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Hi. I'm Stephen Hart from Clarify dot one. Thank you for allowing me to spend some time with you today.

## clariFAM

**Better** instrumentation controllers/drivers

**Highest** performance and **more** features

Meet or beat **every** hardware and software  
feature of **every** competitor

MSRP **80%** of lowest priced competitors

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I'd like to review with you our new family of instrumentation controllers. We're shooting for the very high-end in terms of performance and features. But also we're significantly undercutting the competition on price.

## Clarify LLC — hi tech :) job done right

Small group of dedicated proven engineers in Phoenix, AZ

Decades of practical experience in design, analysis, prototyping

Analog & high-speed digital electronics

Optics & optomechanics

Scientific & numerical software

Systems engineering

**Assists every step of new product/technology introduction**

Concept creation, through prototyping and development

Absolute commitment to communicating clearly — no surprises, no BS

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First, who is Clarify dot one?

We're contract engineers in Phoenix. We've been developers, users, and programmer of optical instruments since the early 1980s. Initially we developed these new controllers for our own needs, and for a variety of other projects we're working on.

## clariFAM — Better instrumentation controllers/drivers

### Highest performance and more features

Meet or beat **every** hardware and software feature of **every** competitor

### Lowest price

MSRP **80%** of lowest-price competitors

### Examples

Thermo Electric Coolers (TEC), Laser-Diodes, motors, meters/loggers, ...

Detailed example is a TEC controller

### Same approach applied to other devices

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By better controllers, we mean that we meet or beat **EVERY** hardware and software feature of **EVERY** competitor, but we do this at a meaningfully lower price. And our design strategy is applicable to any kind of instrumentation controller. The specific examples I'll be detailing today are our TEC controllers. But we also have Laser Diode controllers, and we're developing a wide variety of other systems.

## Market size

Not much public data on the TEC controller/driver market, but...

TEC market \*

US\$ 368.5 million (2017)

Growing with a projected 14.2% CAGR (2017–2022)

Strongest growth in automotive and medical-device markets

Largest market is US

Strongest growth in India and China

\* [www.researchandmarkets.com/reports/4267770/thermoelectric-generators-market-by-source#rela0-4668355](http://www.researchandmarkets.com/reports/4267770/thermoelectric-generators-market-by-source#rela0-4668355)

Meaning many engineers working with TECs

Good market for bench-top instruments for R&D and production test

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What's the market for TEC controllers ? It's hard to say for certain. There's not much data out there. But the TEC market itself is doing very nicely. And every engineer or scientist working with TEC applications needs a way to control them. So we feel quite bullish here.

# Competitive landscape



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What are we competing against ? This is every competitive TEC instrument controller available today on the US market.

We've identified 29 instruments. I'm excluding bare chips and modules which a purchaser could in theory use to build their own instrument.

The four at lower left aren't really competitive because you have to tune their temperature-control loop manually... with resistors in the case of the cheapest one.

Our first two TEC offerings include the 50 Watt clariTEC-50 at US\$795, and the 500 Watt clariTEC-500 at US\$2,395.

And I'm going to provide detailed comparisons against two other products, both from Arroyo Instruments.

Highest performance and more features

Meet or beat **every** hardware and software  
feature of **every** competitor

We understand this is a big claim: how do we beat every competitor ?

## Highest performance — Modern hardware

### Powerful up-to-date cost-effective microcontroller

Microchip/Atmel ATMEGA2560-16AUR

### Professional PCB layout by highly-experienced EEs

Better signal integrity

Better reliability

Cost-effective reliable connectors

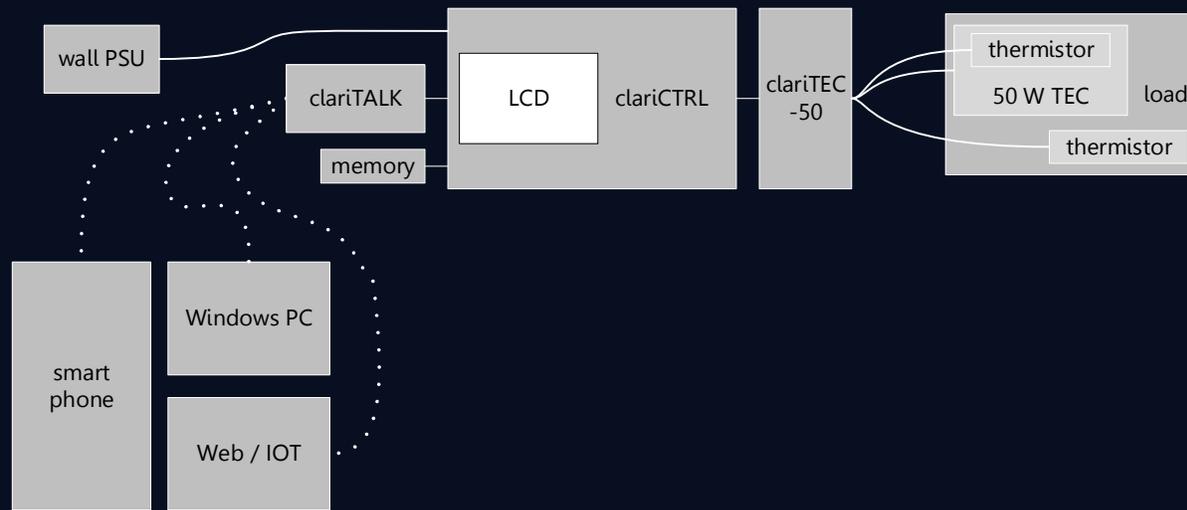
### Hardware partitioned by function

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Trademarks are the property of their respective owners and are hereby acknowledged

First, we're using much more modern hardware. By the way, that gives us a huge amount of analog and digital I/O, which we make good use of. And second we're dividing our hardware tasks so that we get economies across the whole family of instruments.

## Hardware architecture



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Patent pending, and specifications subject to change without notice for product improvements

The main board, we call it clari-control, is the brains and the heart of the instrument. It's common across all our instruments.

It's powered by a wall-wart, and we plug in a personality board to turn it into a specific kind of instrument.

In this case I'm showing a TEC-50 personality board. driving a 50 Watt TEC, cooling and heating my customer's load, with a thermistor for feedback so the clariCTRL can lock in the desired temperature.

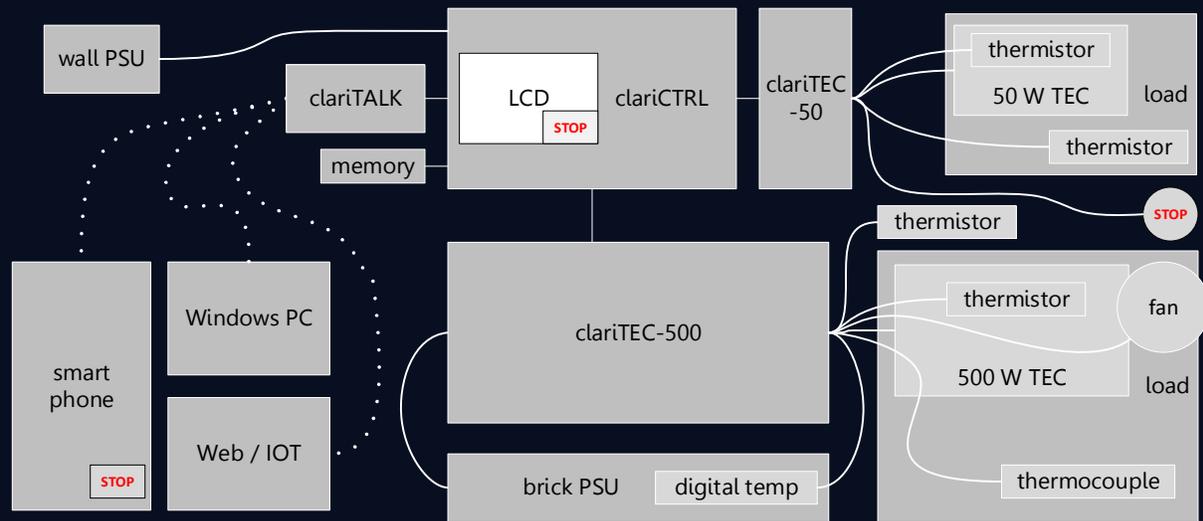
There's a full-color touch-screen on the clariCTRL, so the user can configure the instrument properly and see what its doing.

I've added what we call a clari-talk module which plugs into the clariCTRL, and provides a communication protocol. Let's say Wi-Fi, though as you'll see later we have different clariTALKs for any protocol our customers might need.

The clariTALK can talk to a smart-phone or tablet, not just Windows. Or it can talk to the World Wide Web, or to the Internet-of-Things.

And I've inserted a memory card into the clariCTRL, so now we have 32 GB of local storage for data logging. And a second thermistor to read the temperature at the back-side of the TEC.

## Hardware architecture



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Patent pending, and specifications subject to change without notice for product improvements

How about more power ?

The same clariCTRL can also drive a 500 Watt personality board, the clariTEC-500. Actually it has the same footprint as the clariCTRL and the clariTEC-50 combined, so it can live below them in a taller enclosure.

Now I have a more powerful TEC, so I need a larger power-supply to drive it. And I've added a thermocouple so I can read much more extreme temperatures. I've added another thermistor for my ambient air temperature. And a digital temperature sensor to keep track of how happy the power supply is. No problem. As you'll see, we can connect many more temperature sensors than this: our microcontroller has a huge amount of analog and digital I/O.

Finally, I've added a fan to cool the load. And a hardware stop button. Actually, this is still nowhere near our limit, but it shows some of the powerful capabilities of this architecture. I've also put a soft-copy of that emergency stop button on the display of the clariCTRL. And again on the smart-phone app. These are easy... they're "just" software.

## Highest performance — Modern software

### Hand-written low-level code by highly-experienced SEs

Microchip/Atmel Studio 7 for low-level code

### Full support for programmers

API exposes complete functionality

Windows and Android GUIs

LabVIEW | USBTMC | ActiveX | VISA | VS.NET | VBA | VC++/# | Python ...

### clariSCRIP — event-driven sequencer for end-users and OEMs

### Software partitioned by function

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Trademarks are the property of their respective owners and are hereby acknowledged

And talking of software, just as we've partitioned our hardware, we've done something similar for the software.

So at the low-level we program the microcontroller directly, for maximum performance.

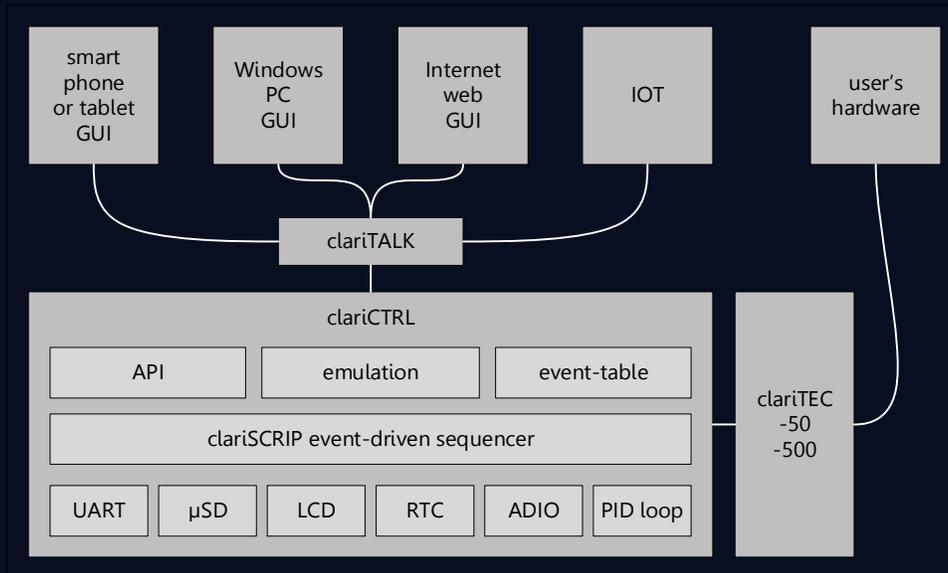
Then we have an API which exposes every feature for programmers.

Plus we have Windows and Android GUIs for non-programmers.

And we've got plenty of compute power on board, so we've provide emulation interfaces for popular languages and protocols, such as LabVIEW or Python.

On top of that we provide our own clari-scrip system, which isn't just scripting or macros... it's actually a way for users to **PRESCRIBE** how the whole system is to behave. So for example, customers can define a whole test sequence in it, taking data over a range of temperatures. Or in a none-TEC scenario, they could program their aquarium lights to turn on at sunrise. We do actually have a personality board for high-end aquariums.

## Software architecture



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Patent pending, and specifications subject to change without notice for product improvements

Here's an overview of that software partitioning.

The clariTALK handles all communications, whether that's RS-232 to a legacy program running on a PC, or the latest Internet-of-Things protocol running over Bluetooth.

That communication is channeled through the clariTALK to the clariCTRL, which has the programmer's API, the emulation of other protocols and languages, and the event-table for clariSCRIP.

Then clariSCRIP coordinates all the activities of these software interfaces, and connects them to the underlying hardware, including the clariCTRL's on board storage and display, the analog and digital I/O, and things like temperature-control loops that need to be closely coupled with the user's hardware.

And finally, the personality board turns this into a specific instrument, a TEC-controller in this case, and connects it to the user's hardware.

## Highest performance and more features — Emulate and extend

### Emulate **every** feature of **every** competitor

Includes all necessary features for legacy customers and applications

Protect software investment for manufacturer, OEM, and end-user

Emulate legacy communications protocols — USB, RS-232, GPIB, RS-485

Emulate legacy command-sets

### Extend

**Add** more I/O

**Add** more limits, plus logging and event-driven procedures

**Add** more comms protocols — add Ethernet, Wi-Fi, Bluetooth, SPI, I2C

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This hardware and software architecture has enough power to support **EVERY** feature on **EVERY ONE** of the competing controllers. If they have an output pin for something, so do we. If they have an input, so do we.

And we can emulate their entire command set, to protect their customers' software investment.

But then we go further. We add a lot more I/O, plus massive amounts of on-board storage for data logging, plus the clariSCRIP automation, plus all the more modern communications protocols such as Bluetooth for their smart-phone.

## Highest performance and more features

### Microcontroller — Microchip/Atmel ATMEGA2560-16AUR

16 MIPS at 16 MHz

256 kB flash, 8 kB SRAM, 4 kB EEPROM

4 × UART, 5 × SPI, I2C, JTAG

86 general purpose I/O pins, including...

TTL — 54 pins (16 with PWM)

ADC — 16 × 10-bit at up to 76.8 kHz

Counter/timers — 4 × 16-bit, 2 × 8-bit

None of these pins are taken for internal use by Clarify

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I'll not go into all of these details, but the microcontroller we're using has far more I/O capability than we need, and we expose it all to the personality boards and hence to the end-user.

## Highest performance and more features

### Clarify adds even more I/O

- +5 V analog reference

- +5 V @ 1 A and +12 V @ 2 A power

- Real Time Clock with battery backup

- 32 GB memory card reader

- Beeper

All I/O pins (Microchip/Atmel + Clarify) routed to outside world

- Board-connector to labelled bare-end cable for end-user customization

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But even that wasn't enough I/O for us ! So we added a whole bunch more, like, for example, a real-time clock so clariCTRL knows what time it is, and can log data and events with accurate timestamps. Again, I'll skip the details.

## Highest performance and more features

### Plug-ins — clariTALK modules

Plugs into clariCTRL

One per protocol

- Default protocol — USB (port or HID)
- Legacy protocols — RS-232, GPIB (USBTMC), RS-485
- Newer protocols — Ethernet, Wi-Fi, Bluetooth
- Low-level protocols — SPI, I2C

Hot swappable... to reduce returns

I2C-link  
Bluetooth  
USB-HID  
RS-232  
Wi-Fi  
USB-port  
SPI  
Ethernet



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I've mentioned we have a lot of communications protocols. Each is implemented as a separate clariTALK module. Here's a stack of them.

There's the Ethernet at the bottom.

The blue one is of course Bluetooth. No plugs on the Bluetooth because the antenna's inside.

Ditto for the black one which is Wi-Fi.

The red one on top is a bit exotic. It's a daisy-chain I2C interface. I've spun it around so you can see how it plugs into the clariCTRL board. Actually, they all have exactly that same connector on the back.

## Highest performance and more features

### Common control board — clariCTRL

Microcontroller

Additional I/O

Display — 2.8" full-color back-lit touch-screen LCD

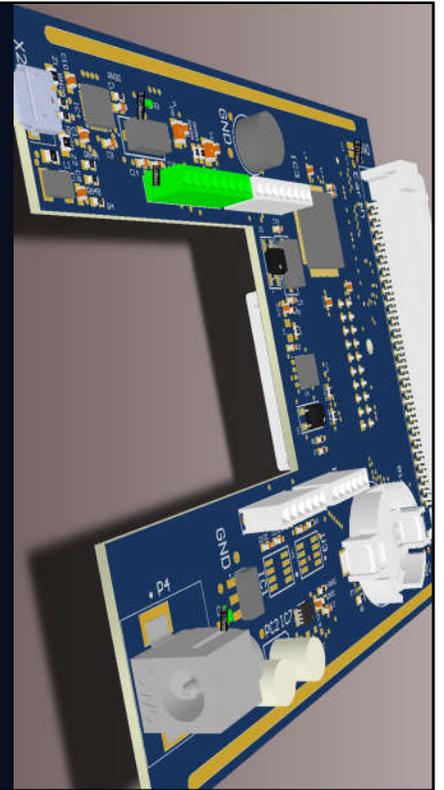
Memory card reader —up to 32 GB

Power and signal conditioning/distribution/fusing

Connectors to...

clariTALK module

Plug-in personality/expansion boards



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The clariTALK slot into the clariCTRL. In fact the clariCTRL board wraps around the clariTALK, and guides it into the connector.

The LCD sits on top, attached via four connectors. One's green in this picture.

The clariTEC-50 personality board is quite small and connects via the big connector on the back end here. It's a big connector because it routes all those I/O signals out to the personality board and to the end-user's hardware.

Then there's another connector you can't see on the back of the clariCTRL, which connects to a larger clariTEC-500 below, when that's needed.

## Highest performance and more features

### Small personality boards for low-power devices

Up to ~ 50 W TDP

Small motors, TECs, LDs, Relays

Data/temperature logger

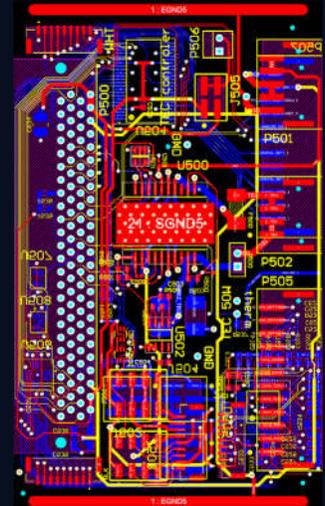
Environmental test chamber

DMX

Protoboard for end-user customization

Comms passthrough for protocol conversion

...



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The small personality boards can handle external devices up to about 50 Watts. So that's good for medium size TECs, data loggers, environmental test chambers, things like that.

We also have a protoboard version for customers with unique needs.

And a comms-passthrough board to take in one protocol, like maybe commands in the specific language of one TEC controller coming in over RS-232, and convert it the language of an entirely different controller which expects to see a USB interface for example.

These really are quite small but dense boards. This for example is a clariTEC-50 personality board. Lifesize that's 100 by 35 mm.

## Highest performance and more features

### Full-size personality boards for high-power devices

Extra-height enclosure

Ultra-quiet small fans if needed

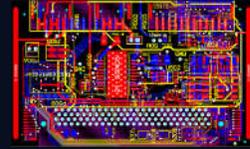
60 mm 17 dB(A) for 14.5 cfm

Examples...

500 W TEC, multiple high-power Laser Diodes

Plug-in modules for sensor-conditioning

Legacy connectors



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The full-size personality boards allow us to handle much more power for applications which need that. Plus we have more space for special connectors and I/O conditioning circuits and so forth. This is one of the alpha prototypes of our clariTEC-500 personality board, for 500 Watt TECs. I'll say something later about where we are in the development process. This board is 100 by 185 mm, so it fits below a clariCTRL and a small personality board it in an extra-high enclosure.

For comparison, I'm showing the clariTEC-500's full-size personality board to scale with a clariTEC-50's small personality board.

## Highest performance and more features — Universal software

Accessible from PC / smart-phone / tablet / Internet

Full feature-set exposed by API

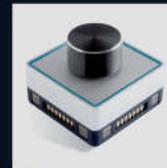
Protocol and command-set emulation

Drop-in replacement of legacy products

Protects end-user and OEM software investment

**On-board software**

Sequencing, speed, unattended operation, UI,  
logging, diagnostics, alerts, interlocks, ...



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Then on top of this modular hardware we have a layer of modular software. That includes many functions which actually have to run in the clariCTRL itself. So that would include the clariSCRIP sequencing, plus stuff which has to run even if the clariTALK is removed or an attached PC goes to sleep. And the User Interface on the clariCTRL's display.

By the way, if the customer doesn't like touch screens, we can hook up real dials and buttons like this.

## Highest performance and more features — On-board software for...

### End-user defined event-driven sequencing

Start / ramp up / cycle / alarms / ramp down / shutdown

Test automation

### Low-level / real-time / low-latency functions

Device and sensor characterization and calibration such as...

Thermistor characteristics (Steinhart-Hart coefficients, etc)

PID auto-tune and operation, TEC AC resistance, Laser RGB white-point

### Unattended / long-term operation

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I'll not go into details of all the software features clariCTRL provides on-board.

## Highest performance and more features — On-board software for...

### Logging and charting

Memory card up to 32 GB

Charts on clariCTRL display

### Diagnostics and alerts...

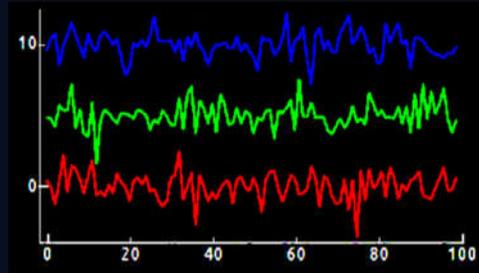
Continuity | connectivity

Current | voltage | power | duty cycle | temp | process limits | trends ...

High | low | rate-of-change limits

### Manual interlocks and kill switch

Hardware and software



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But one of the nice things about the on-board software is that it **IS** soft.

So for example we can easily add application-specific charts and soft-controls on the touch-screen. In fact, the user can change this layout themselves if they like.

But also we can hook up physical controls like this nice big panic button if that's what the user likes.

Lowest price

MSRP **80%** of lowest price competitor

Ok, that's what we can do. And it's a lot. How can we be so cost-effective ?

## Lowest price — Don't get eaten-alive by design costs

### Commonality and modularity across product line

Don't reinvent the wheel, improve the best wheel designs

### Hardware reuse via functional partitioning

Plug-in communications modules

Common control board

Numerous fully-programmable digital and analog inputs and outputs

Plug-in application/device-specific personality/expansion boards

### Software reuse via functional partitioning

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First, we have to avoid being eaten-alive by our design costs. So most of the hardware and most of the software is shared across all our instruments. Only the personality board changes.

## Lowest price — Don't get eaten-alive by manufacturing costs

### DFM — Design for Manufacture

Popular components, readily and rapidly available, RoHS

No import/export restrictions

Fully programmable back-lit LC touch screen display

No other mechanicals

Contract manufacturer in Guangzhou

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Second, it's all been designed to be highly manufacturable by our Contract Manufacturer.

## Lowest price — Don't get eaten-alive by test costs

### DFT — Design for Test

- Full complement of PCB test points

- I/O-loopback and cable-ringout for test and burn-in

- Connectors and LEDs for test

  - Can be depopulated for shipping units

Third, it's stuffed full of self-test features for debug and for production-line testing.

## Lowest price — Don't get eaten-alive by support costs

### DFS — Design for Support

Full open-source multiple-language written and video documentation

Foolproof setup

Foolproof operation

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And fourth, it's designed in ways which allow us to provide a very-high level of customer support, very cost effectively, from the moment it ships from our manufacturer.

## Lowest support-cost — Foolproof setup

### Power / EMI / Signal integrity

International power supply with UL and CE

Our side is all low voltage

FCC Part-A — more stringent: business, industrial, commercial

Independent analog and digital cable/shield grounds

Metal case

Chassis ground

Line drivers/receivers

High-density push connectors



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Key to that is foolproof setup: so the customer is up and running quickly and we field as few service calls as possible.

Again, I won't go into every detail here.

But, for example, we're very proud of the connectors we included. All the wires to the TEC and temperature sensors and everything else push in here and are safely latched. No messing about tightening down screws. And we don't need expensive legacy connectors, though we can provide them via in-line extension cables if needed.

## Lowest support-cost — Foolproof setup

### All parts and connectors hot-swappable

Unless attached device or legacy connector prevents this...

Polarized/keyed, physically unique, color-coded, and labelled

Pin lengths — ground connects first, then power, then data

No easy-to-lose/swallow/break parts, captive screws

Safe to ground/short pins within any one connector

Probably not for attached devices !

Detect/report/resolve incorrect/reversed/missing connections

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More fool-proofing. It's not that we think our customers are foolish, but mistakes happen. We try to prevent mistakes by thoughtful and experience design, because that minimizes our support costs. And it keeps our customers happy.

## Lowest support-cost — Foolproof operation

### User-definable soft start/stop, auto run, and emergency stop

To protect attached devices

To protect users

### Monitoring and logging

To predict/detect failure of attached devices

### Fully programmable back-lit LC touch screen display

No hardware switches, buttons, knobs

Usability updates/extensions/revisions are “just software”

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And once the customer has it installed, we've also taken design steps to ensure it's foolproof in operation. I'll skip the details, but just for example we use some of that extra I/O capability to measure and log the current and voltage to the TEC, so we can compute its AC resistance, and warn the user if their TEC is dying on them.

# Competition

Talking of customers, let's now look at the existing TEC controllers we're planning to displace.

# Competitive landscape



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You saw this already. It's every competitive TEC instrument controller available today on the US market, excluding bare chips and modules. So its bench-top instruments, not raw parts.

And these four at lower left aren't really competitive because you have to tune their temperature control loop manually.

Our first two TEC offerings include the 50 Watt clariTEC-50 at US\$795, and the 500 Watt clariTEC-500 at US\$2,395.

And I'm going to provide detailed comparisons against two other products, both from Arroyo Instruments.

## Highest performance, more features, lowest price — Examples

### Arroyo Instruments

Model 5240

\$995 MSRP

32 W

### Arroyo Instruments

Model 5400-15-28

\$2,995 MSRP

420 W



<http://www.arroyoinstruments.com>

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I really like these instruments, and they are **VERY** competitive.

The 5240 is their entry-level TEC controller at the \$1,000 price point for 32 Watts of output power. The 5400 is near the top of the range. It has a lot more features and drives a lot more power, but also it's a lot more expensive.

## Highest performance, more features, lowest price — Examples

### Arroyo Instruments 5240

USB, autotune PID loop, thermistor, fixed-speed fan, beeper

\$995 MSRP, 32 W



### Clarify clariTEC-50

all the Arroyo 5240 features + Ethernet | Wi-Fi | Bluetooth | USB + ...

6 × thermistors, 2 × digital, RTD & TC + ...

16 × TTL, 3 × relays, 8 × analog out, 8 × analog in

\$795 MSRP, 50 W

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I think the 5240 is a really nice entry-level controller. It has USB. It has autotune to set up its temperature control loop. And a thermistor-input so it knows the temperature. It can drive a fan to help cool the target system. And it has a beeper. That's really everything you need to get started.

How does it compare with the clariTEC-50 ?

Well, first off, we offer **EVERY** hardware and software feature of the 5240.

Then we add all these modern communications protocols. And where they have one thermistor, we have six. That's probably overkill, but it's nice to be able to lock to different sensors, and to log the temperature at more than one location. Plus we have a couple of digital temperature sensor inputs if you're not using an old-school thermistor. Or, on the other hand, you can use an RTD for ovens which get too hot for thermistors. Or a thermocouple for furnaces which get **WAY** too hot. Not done yet ! We have 16 digital I/O lines to sense and control your hardware. Plus three relays if you need to switch something that TTL can't handle. And eight analog inputs to read other parameters of your system, and for remote temperature control. Plus eight analog outputs to drive your equipment, and for temperature tracking.

But our MSRP is two hundred dollars lower. And we actually have usefully-higher output power.

## Highest performance, more features, lowest price — Examples



### Arroyo Instruments 5400-15-28

USB, RS-232, autotune PID, 6 × thermistors, beeper, digital sensor, 3 × RTD, variable-speed fan, interlock, 5 × TTL, 2 × relays, analog out  
\$2,995 MSRP, 420 W

### Clarify clariTEC-500

all Arroyo 5400-15-28 features + **Ethernet** | **Wi-Fi** | **Bluetooth** | **USB** + ...  
**20 × thermistors**, **2 × digital**, 3 × RTD | **TC** + ...  
**4 × variable fans**, **16 × TTL**, **5 × relays**, **8 × analog out**, **8 × analog in**  
\$2,395 MSRP, **500 W**

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Now let's look at the high end. This is Arroyo's 5400.

They've added quite a lot of useful stuff. Like RS-232 as well as USB. Six thermistors, for the reasons I already mentioned. And that digital temperature sensor input. And three RTDs for ovens. The fan is now variable-speed, which is nice. Plus you get a handful of TTL lines, a couple of relays, and an analog output. And a lot more power capacity. But it does cost two thousand dollars more.

Let's compare it to the clariTEC-500.

Once again, we've provided **EVERY** hardware and software feature of the competition.

Plus the extra communications protocols: not just USB and RS-232. I think we may have gone a bit crazy on the thermistor count, but why not? We've got plenty of spare I/O capacity. And we doubled up on the digital sensors. And of course in addition to the three RTDs we support three thermocouples. They made their fan variable-speed. So did we. But we can drive four of them. And more than three times as many TTL lines. More than twice as many relays. And not just one analog output: we have eight out and eight in.

But despite adding all that functionality, our MSRP is six hundred dollars lower. And we drive more output power.

## Laser Diode controller/driver example

Commonality and modularity  
of hardware and software  
across product line

Just briefly, I want to say that all the same kind of performance and pricing benefits also apply to our Laser Diode controllers.

## Highest performance, more features, lowest price — LD example

### Hardware and software reuse across clariFAM



- Plug-in comms modules

- Common control board

- Plug-in personality boards

- Legacy emulation, and clariSCRIP for control

### Emulate and extend **every** features of **every** competitor + ...

- RGB lasers, optical power and color, TEC, shutter, motor, motion sensor, PWM to 500 kHz, high / low / rate limits, safe start for users and lasers, ...

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For example, here's Arroyo's entry level LD controller. It looks a lot like their entry level TEC controller, because frankly the jobs are quite similar.

Ours offers the same hardware and software advantages as I've described before.

And then of course we go much further. So we drive three lasers, not just one. And we can read in optical power and color sensors. We throw in a small TEC controller on the same personality board. Plus control lines for shutters and small motors. Even a motion sensor, so when an earthquake hits we can turn off the lasers. Talking of on/off, we don't just drive these lasers at fixed powers: we can modulate them up to 500 kHz. Plus clariSCRIP allows us to set low and high limits for powers or even for color offsets. And rate limits to detect problems early before they get out of hand. Plus safe start up and shut down procedures. That's safe for the lasers — we don't just hit them with full-power at turn on. But it's also safe for the user. A friend of mine recently got flashed in the eye by a high-power green laser in a lab he was unfamiliar with. He's fine, but he was lucky. We ramp lasers up at a user-defined rate, so there's plenty of warning if somehow the system isn't otherwise as safe as it should be.

## Status and schedule

We've been using these designs in-house for a while now. Where are we in the process of commercializing them ?

## Status and schedule

Nov 2018 — Design started

Feb 2019 — Demo hardware and software at Photonics West

Apr 2019 — Beta clariCTRL boards ordered from off-shore CM

May 2019 — Beta clariTEC-50 boards from US rapid PCBA house

May 2019 — In-house beta testing

Jun 2019 — External beta program starts, teaser website

Aug 2019 — Commercial availability

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Here's the history, and some upcoming milestones. As you can see, we work pretty fast. And going forward we can do custom personality boards really quickly. Because all the clariCTRL hardware and all the clariTALK hardware stays the same. And actually most of the software stays the same too. Even most of the enclosure hardware.

We plan quite a long beta program, to ensure we've covered all the bases. But we'll list it for sale as soon as the beta gives us the confidence that we can meet our timeline.

And then what the customer gets is ready-to-use out of the box, including of course all the little stuff like power supplies and cables. But also including some actual hardware to get started with. So a low-power TEC or laser diode, and a thermistor, for example. That way they can get confident following along with the quick-start guide without having to even touch their own hardware until they've seen how it all works.

## clariFAM

**Better** instrumentation controllers/drivers

Meet or beat **every** hardware and software  
feature of **every** competitor

MSRP **80%** of lowest priced competitors

40

So finally, in summary, clariFAM is a **BETTER** family of instrumentation controllers. With **EVERY** feature of **EVERY** competing product. Plus a whole bunch more. And at a meaningfully **LOWER** MSRP.

clarify.one

hi tech :) job done right

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Thank you so much for your time today.