ER1200

Operations & Service Manual

TESCOM
CORPORATION
ELECTRONIC CONTROLS DIVISION

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GENERAL OPERATION

ER1200 VERSIONS

This manual is a comprehensive documentation of specifications and operations of all versions of the ER1200 Series regulator. The following table summarizes the differences in features for different ER1200 versions. Use this table to check the version number of your ER1200. The versions without an internal sensor do not have an “internal feedback” mode option.

PART NUMBER	INTERNAL SENSOR (0-100 PSIG)	18" CABLE AND STRAIN RELIEF	WATER TIGHT CONNECTOR AND 2' MATING CABLE
ER1200-1	Yes	Yes	No
ER1200-2	Yes	No	Yes
ER1200-1-1	No	Yes	No
ER1200-2-1	No	No	Yes

INTRODUCTION

The ER1200 is a closed loop pressure control system capable of operating in two different modes. In the “Internal Feedback” mode, the control is based on the internal pressure sensor, which has a range of 0 - 100 PSIG. In “External Feedback” mode, the PID algorithm is based on an external, customer provided transducer. The ER1200 requires both a setpoint, which is the desired output pressure, and a feedback, the actual output pressure.

INTERNAL FEEDBACK MODE

In internal mode, the ER1200 compares the feedback signal from the internal pressure sensor to the setpoint input. Inside the unit, there are two solenoid valves that control the output pressure. If the feedback signal is below setpoint, the ER1200 opens its inlet valve and increases output pressure. If the feedback is above setpoint, the ER1200 opens its exhaust valve to decrease the output pressure. Every 25 milliseconds, the feedback is compared to the setpoint and a correction is made to make the output pressure equal to the desired.

Inlet pressure:

Typical – 110 PSIG
Maximum – 120 PSIG
Minimum – 10 PSIG above required controlled output pressure

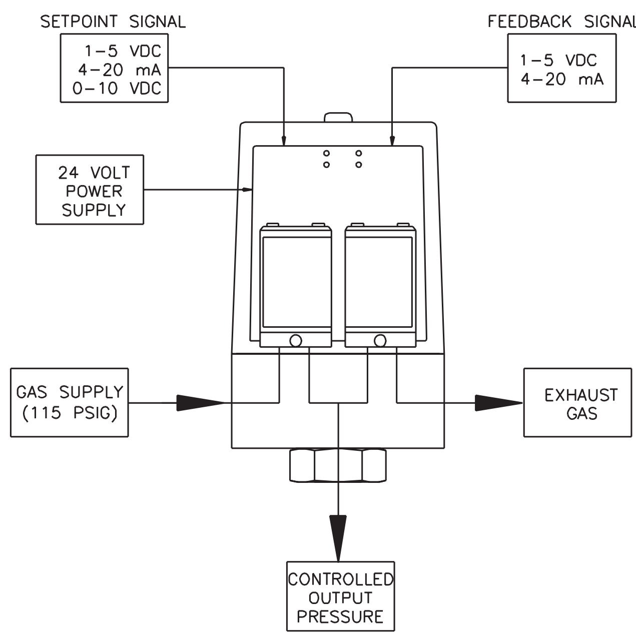


Figure 1

EXTERNAL FEEDBACK MODE

In External Feedback mode, the ER1200 can be used to control flow, position, temperature, or any other variable that can be affected by a change in pressure. For the purpose of this operation manual, we will discuss the control of pressure. In this mode, the ER1200 compares an external feedback signal from a customer supplied transducer to the setpoint. Typically, this mode is used when the ER1200 is combined with either a pressure reducing or back pressure regulator *(shown with a ratio actuated, pressure reducing regulator, Figure 2)*. If the feedback signal is below setpoint, the ER1200 opens its inlet valve and increases output pressure. This increases pressure on the dome of the regulator, opening the main valve and increasing downstream pressure. If the feedback is above setpoint, the ER1200 opens its exhaust valve, which decreases dome pressure, allowing the regulator to decrease output pressure.

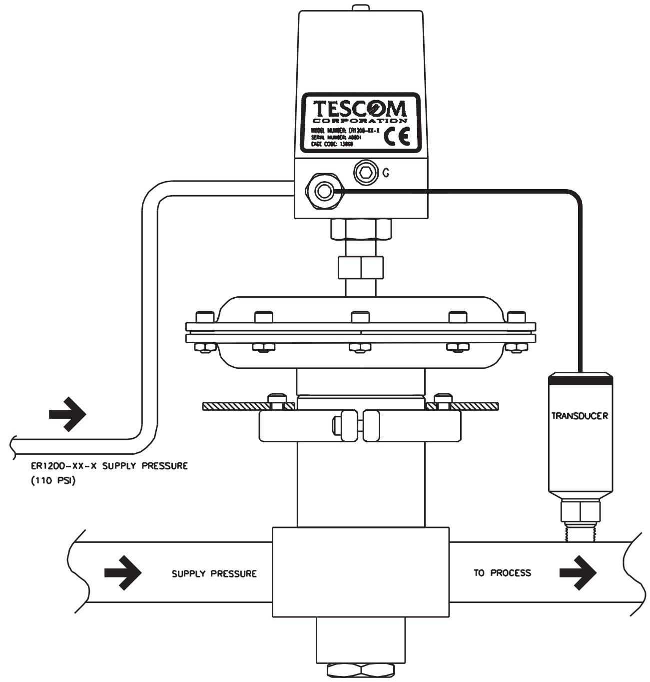


Figure 2

Pressure Connections:

ER1200 inlet pressure is the same as in internal mode. Refer to regulator installation and operation instructions and the product label for maximum inlet pressure information.

SPECIFICATIONS

Enclosure
NEMA 4 housing

Mounting
2 10-32 UNF mounting holes

Power Requirement
24 Volts DC +/- 2 volts
150 milliAmp typical current draw

Input Signals
All signals are field configurable using onboard jumpers:
Setpoint: 4-20 mAmp, 1-5 VDC or 0-10 VDC
Feedback: Internal (0-100 PSIG) or external
External Feedback: 4-20 mAmp, 1-5 VDC or 0-10 VDC

Inlet Pressure
Maximum: 120 PSIG
Typical: 110 PSIG
Minimum: 10 PSIG above desired output pressure

Media
Clean, dry, inert gas

Environment
Temperature: -10°F to +150°F

Flow Stream Materials
300 Series SST, Buna-N, 6000 Series Aluminum, Brass, Nickel, Silicon, Gold, Glass, RTV

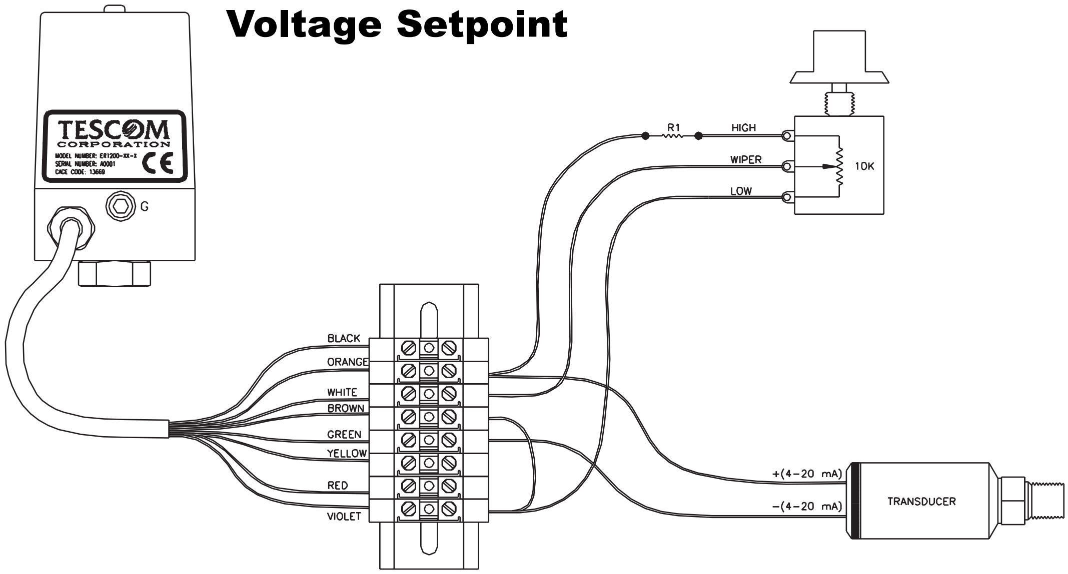
Performance
Total Accuracy: +/- 0.25%
Linearity: +/- 0.1%
Repeatability: +/- 0.12%
Flow Capacity: C_V = 0.03

ELECTRICAL INSTALLATION

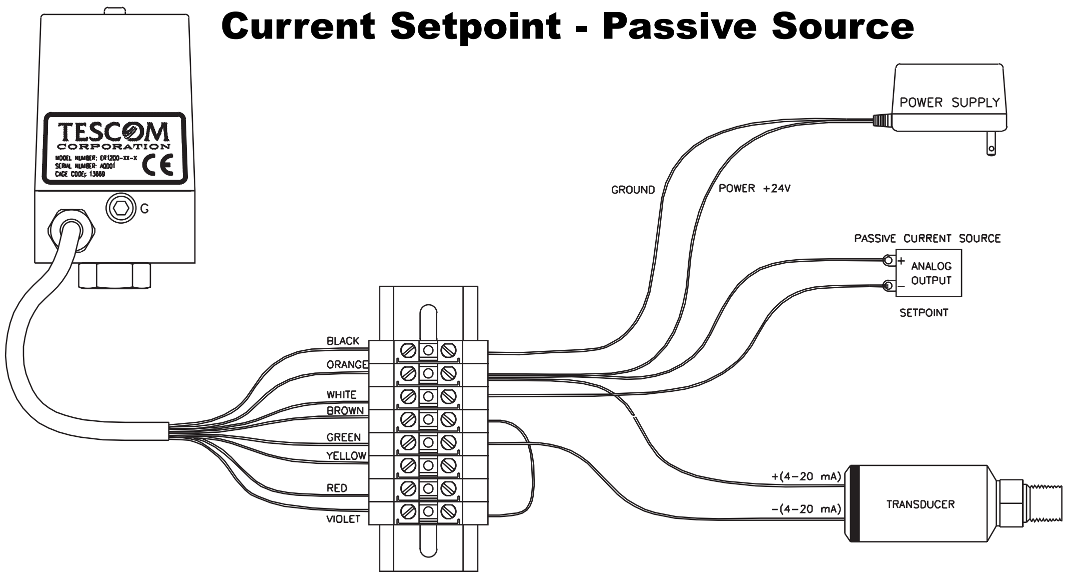
Wire Number	Wire Color	Function
1	White	+ Setpoint
2	Brown	- Setpoint
3	Green	+ Feedback
4	Yellow	+ Analog Output
5	Black	Power Ground
6	Red	+ TTL Output
7	Orange	+ 24 VDC Power
8	Violet*	Secondary Ground

**Not available for ER1200-2 and ER1200-2-1*

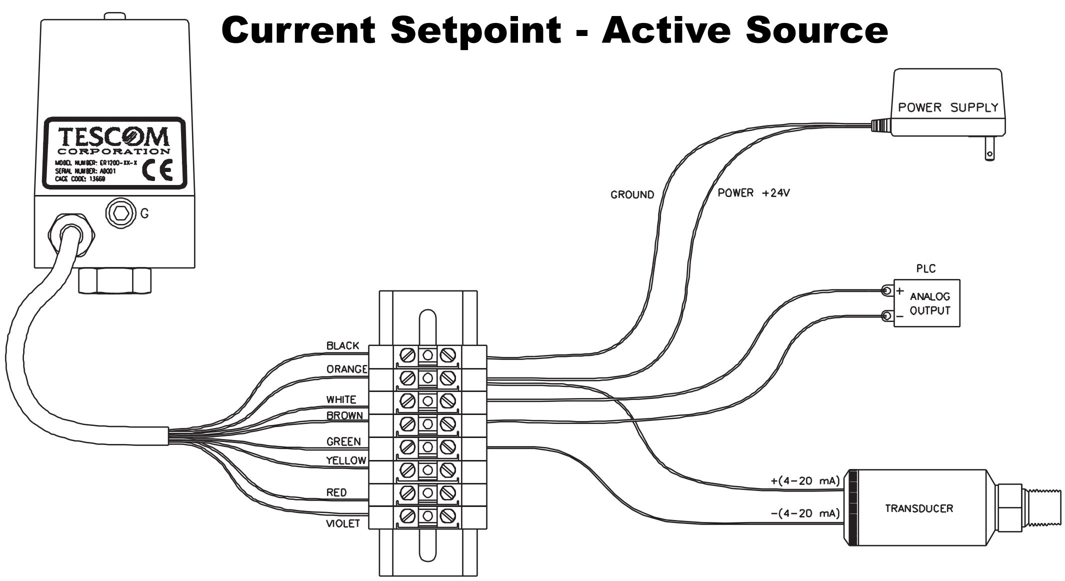
Voltage Setpoint



Current Setpoint - Passive Source



Current Setpoint - Active Source



ER1200 CONFIGURATION

There are two printed circuit boards inside the ER1200. The bigger, vertical board is the control board. All the jumpers used to configure the ER1200 are located on this board. The tuning and calibration pots are also located on the control board. *(See page 6 for details on tuning the ER1200.)*

The smaller, horizontal board has two pots used to zero and span the internal sensor. These pots are set at the factory and should **NOT** be adjusted.

CAUTION: CONFIRM POWER SUPPLY IS OFF BEFORE MOVING JUMPERS.

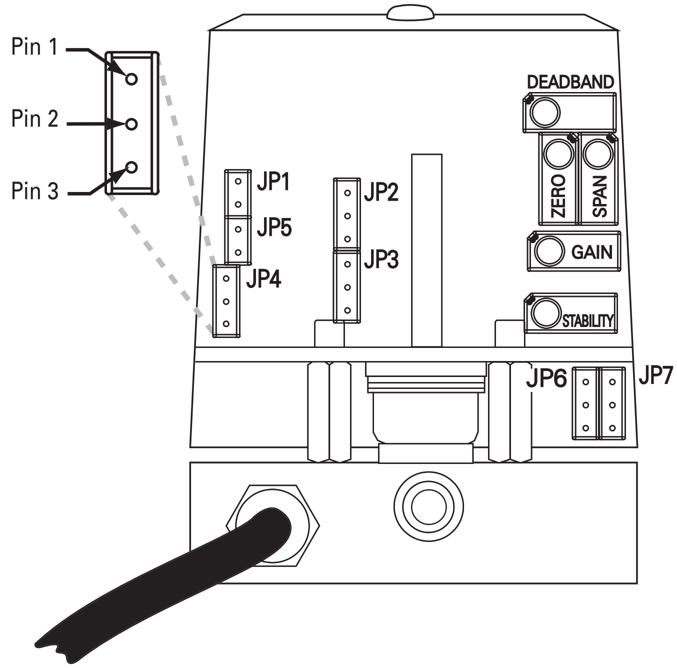


Figure 3

CONFIGURE SETPOINT SIGNAL

MODE – JP1

- **Current Setpoint Mode:** Install Jumper
- **Voltage Setpoint Mode:** Remove Jumper

RANGE – JP2

- **4-20 mAmp/1-5 Volts:** Install Jumper on pins 1 & 2
- **0-10 Volts:** Install Jumper on pins 2 & 3

CONFIGURE ANALOG OUTPUT SIGNAL

MODE – JP6

- **Current Output Mode:** Not available
- **Voltage Output Mode:** Install Jumper on pins 2 & 3

RANGE – JP7

- **1-5 Volts:** Install Jumper on pins 1 & 2
- **0-10 Volts:** Install Jumper on pins 2 & 3

CONFIGURE FEEDBACK SIGNAL

MODE – JP5

- **Current Feedback Mode:** Install Jumper
- **Voltage Feedback Mode:** Remove Jumper

RANGE – JP4

- **0-10 Volts:** Install Jumper on pins 1 & 2
- **4-20 mAmp/1-5 Volts:** Install Jumper on pins 2 & 3

SOURCE – JP3

- **Internal Feedback Mode:** Install Jumper on pins 1 & 2
- **External Feedback Mode:** Install Jumper on pins 2 & 3

TUNING THE ER1200

There are 5 adjustments located on the control card. The initial factory pot settings are listed in the following table.

FUNCTION	CLOCKWISE TURNS
Gain	11
Stability (Integral)	5
Deadband	7
Zero	18
Span	13

Note: The counter-clockwise end point from which to start turning the pots is found by rotating the pot counter-clockwise 25 turns.

- The easiest method for calibrating and tuning the system is to use a volt meter to monitor the setpoint and feedback voltages.
- Turn all the pots back to the factory settings.
- Apply a setpoint signal of at least 12.5% (6 mAmps, 1.5 VDC if 1 - 5 VDC, or 1.25 VDC if 0 - 10 VDC).
- Rotate the Deadband pot until exhaust gas can barely be felt escaping from the exhaust port *(see Figure 1, page 1)* on the base of the unit. Rotating the deadband pot clockwise will decrease the deadband to the point that the inlet and exhaust solenoid valves will operate continuously. This will result in a very accurate tracking response, but obviously consumes gas. If the deadband is increased by rotating the pot counter-clockwise, pilot gas will be conserved, but the system will not respond to a change in setpoint or feedback until the error signal is larger than the imposed deadband voltage. This can result in drifting of the feedback signal or no response to a small change in setpoint signal.
- Apply a setpoint signal of about 2.5% (4.4 mAmps, 1.1 VDC if 1 - 5 VDC, or 0.25 VDC if 0 - 10 VDC). Measure the feedback signal and adjust the zero pot until the feedback signal matches the setpoint signal. Rotating the zero pot clockwise will increase the feedback signal and a counter-clockwise rotation will decrease the feedback signal. Sufficient time should be given for the system to respond between each adjustment of the pots, especially if there is a large control volume. Rotate the pots slowly and observe the system reaction.

Zero Pot Rotation Effect

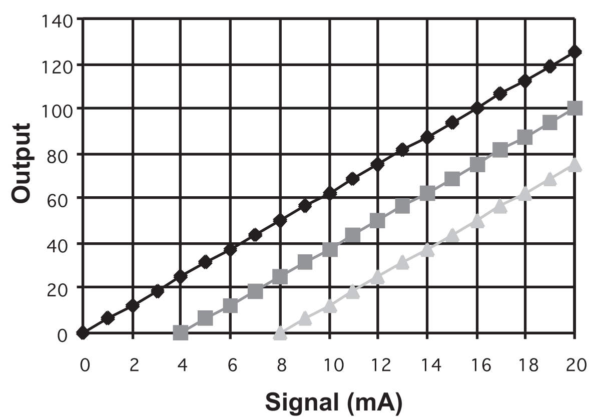


Figure 4: Zero Adjustment

- Apply a setpoint signal of about 95% (19.2 mAmps, 4.8 VDC if 1 - 5 VDC, or 9.5 VDC if 0 - 10 VDC). Measure the feedback signal and adjust the span pot until the feedback signal matches the setpoint signal. Again, sufficient time should be given for the system to respond between each adjustment of the pots. Since the zero and span adjustments interact with one another, it is necessary to readjust the zero after adjusting the span. Recheck the zero and adjust it if the feedback signal does not match the setpoint signal of 2.5%. Continue to recheck zero and span until the feedback signal and setpoint signal match at both the low and high setpoint values.

Span Pot Rotation Effect

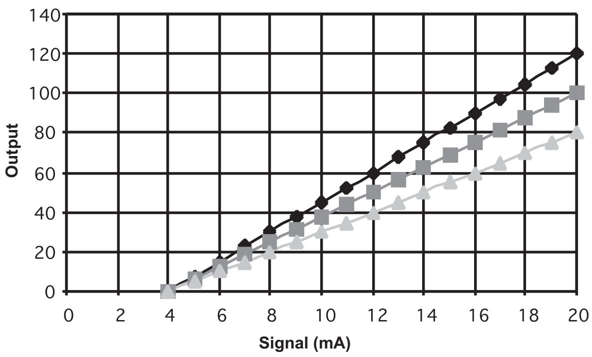


Figure 5: Span Adjustment

Typically, Gain and Stability adjustments are not needed. However, the following general guidelines can be followed to fine tune your system:

Rotating the gain pot clockwise increases the system gain and decreases the system response time. Too little gain will result in slow response and inaccurate signal tracking. Too much gain will result in system instability, fast vibration, or in the feedback signal overshooting the setpoint signal when a large step change in setpoint is initiated.

Rotating the stability pot clockwise will decrease the reset time and quicken the addition of gain into the system. This can again result in setpoint overshoot. Rotating the pot counter-clockwise will increase the reset time and dampen the control response to a step change in setpoint.

The stability adjustment does not interact with any of the other adjustments, however, if the gain or deadband pots are turned at this point, the zero and span will need to be readjusted per the procedure outlined above.

Reaction To Step Change In Setpoint

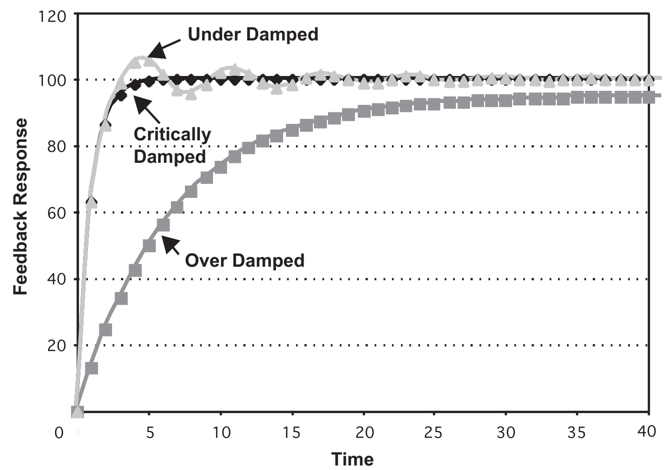


Figure 6: System Response

If the system is experiencing a slow oscillation, decrease the gain by rotating the pot counter-clockwise until the oscillation stops. If the oscillation is rapid, increase the reset action by rotating the stability pot clockwise until the oscillation stops. These settings will be the maximum gain and minimum reset time that can be used with the system as it is configured. If the feedback signal severely overshoots the setpoint signal when a change in setpoint is made, turn the stability pot counter-clockwise alternately with the gain pot (also counter-clockwise), until the overshoot is eliminated.

For very precise tuning of the control, a dual channel storage oscilloscope is recommended so that the user can see the effect of gain and integral adjustment on the response of the system. One channel of the scope is used to monitor the setpoint voltage and the other channel to monitor the feedback voltage. The gain and integral adjustments have the greatest effect on the system response to a step change in setpoint signal. The control can be tuned in this fashion for millisecond response to step changes in setpoint from 0 to 100%. Remember, after adjusting the gain pot, the control will need to have its zero and span readjusted.

TROUBLESHOOTING

ER1200 Symptom	Cause	Remedy
Unable to maintain outlet pressure	ER1200 exhaust valve leaking	Return unit to factory for replacement of valve
	ER1200 supply pressure is not high enough	Check the incoming pressure to the ER1200 and ensure that it is between 10 to 20 PSIG above the maximum desired output pressure
Positive output pressure with zero setpoint	ER1200 inlet solenoid valve leaking	Return unit to factory for replacement of valve
	ER1200 supply pressure exceeds the maximum	Lower supply pressure to less than 115 PSIG
Outlet pressure is equal to inlet pressure	ER1200 not getting a feedback signal	Check transducer wiring and feedback jumper settings
Outlet pressure does not follow setpoint changes	ER1200 jumpers not configured correctly	Reconfigure jumper settings according to page
Outlet pressure becomes uncontrollable (unstable or unable to establish setpoint)	ER1200 GAIN, INTEGRAL, or DEADBAND are out of adjustment	Read TUNING THE ER1200 *(page 6)* in this manual and readjust the gain and pots per that section
	The feedback signal reacts to a process change at a slower bandwidth than the ER1200 (25 milliseconds)	Replace the transducer with one that has a full range response time at least as fast as that of the ER1200
	There are leaks in the downstream pressure line	Locate and eliminate all leaks
	The system design has components that can cause a delay in down stream transducer response while the up stream pressure is allowed to build up (pressure differential between measurement point and source)	Eliminate the flow restriction, or slow down the ER1200 response time by restricting the flow of supply pressure into the ER1200

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