



Product Family: 205/405/Terminator

Number: AN-MISC-015

Subject: Tech notes and suggestions
on how to properly setup a 205/405/Terminator
serial remote IO system.

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Revision: Original

Koyo Remote IO has been in use since the GE series one, following through the TI 325/405 PLC's and is still in use with today's 205, 405 and Terminator IO system. AutomationDirect only supports the SM and RM net serial protocols for serial remote IO. This document is intended to help in the setup of remote IO and give tips as to what to look for and how to troubleshoot a system.

If you do not already have manuals for remote IO, you can download for free any of our hardware manuals from our website. The following manuals all pertain to our remote IO systems:

- D2-USER-M
- D2-REMIO-M
- D4-USER-M
- D4-REMIO-M
- D4-SLICE-M
- T1K-RSSS-M

Depending on what your master and your slave will be will determine which manuals you will need. You will always need the accompanying user hardware manual for each family of PLC hardware you use, as well as the optional analog manuals. For example: If you were using a 405 PLC with D4-RM master going to Terminator T1K-RSSS slave, you would need the following manuals - D4-USER-M, D4-REMIO-M, T1K-RSSS-M and T1K-INST-M.

The following are available masters and slaves that AutomationDirect offers and the supported protocol:

Masters

- D2-250 Port 2 (RM NET ONLY)
- D2-250-1 Port 2 (RM NET ONLY)
- D2-260 Port 2 (RM NET ONLY)
- D4-450 Port 3 (RM NET ONLY)
- D2-RMSM (RM & SM NET)
- D4-RM (RM NET ONLY)
- D4-SM (SM NET ONLY)

Slaves

- D2-RSSS (RM & SM NET)
- D4-RS (RM NET ONLY)
- D4-SSxx (SM NET ONLY)
- T1K-RSSS (RM & SM NET)



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HARDWARE COMPATIBILITY

Any of the above masters will communicate with any of the slaves listed, as long as the protocol matches. For example, a 450 port 3, will talk to: D4-RS, D2-RSSS, and a T1K-RSSS, but none of the other slaves. Masters will not communicate with masters either. You do not have to have matching hardware for your master slave, so if you chose to use 205 as the master, and you want a 405 or even Terminator slave rack, you may do so as long as the protocols match (RM net to RM net & SM net to SM net).

Our remote IO manuals discuss the differences in RM and SM net protocols, but if you are wondering what is the difference, or what is best for your application, here is a quick overview:

- ❑ RM net has a maximum baud rate of 38.4K and SM net has a maximum baud rate of 614.4K. Keep in mind if you are wanting speed, the SM net is faster, but the higher the baud rate, the shorter the distance you are allowed between master and slave.
- ❑ RM net is limited to 3900ft total distance, where SM can run at 19.2K or 38.4Kbaud rate up to 3900ft and less distance as you increase your communications speed. For example: 614.4Kbaud rate is only good for a distance of 328ft total.
- ❑ RM net will support up to 7 slaves and a total of 512 IO in the slaves. SM net will support up to 31 slaves and a total of 512 IO.
- ❑ Aside from speeds and slave count, the only other advantage to the 2 different communications types is the support you can gain by using SM net. If you have the availability to use SM net, your slave will more than likely have a serial communications port on the slave. For example, the D2-RSSS has a RJ12 communications port. This port can be used for communications back to the CPU, almost like having an additional port on the PLC. You can connect to the CPU via this port, and you can use an operator interface on this port, **HOWEVER....** If you chose to use this port for communications, we warn you, *IT WILL BE SLOW!* Customers have used OP panels and Eztext panels on their slave with no problems, but some consider a 2 to 3 second update too slow for a more powerful OIP like eztouch panels. The speed all depends on the scan time of your PLC, and the transfer between your master and slaves.

Here are some further tips on compatibility: If you are looking at Terminator IO, it has a few downsides for Koyo Serial remote IO. It was designed to work with remote IO, but also many other communication masters, so check all specs, and/or call tech support if you have questions on compatibility. Analog cards used in Terminator remote IO will quickly accumulate maximum IO. For example: If you are using an 8pt analog card in a Terminator slave, it counts for 256 discrete IO points. A 16pt analog card counts for 512 discrete IO, so in some cases if you use 1 16pt analog in and 1 16pt analog out, you will reach the maximum IO count and will not be able to further expand.



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SETUP TIPS

Once you have purchased your remote IO, you will have to wire and write setup code for the master and slave/s. These tips will help you and hopefully save you time.

- ❑ When an IO rack only contains input or outputs in a slave, they still must be given a starting address and an IO count of K0. If you skip the setup of either input or output, you will get an error.
- ❑ If using multiple slaves, you can not leave out all IO and **ONLY** use a slave module in the rack with the intent to add IO later. The slaves will error if they do not have at least 8 inputs or 8 outputs. (One I/O card must reside in each slave rack)
- ❑ When setting up your remote IO, you need to use the exact IO count of what you have in the slave rack. Using additional IO counts that are not existent at the time of setup will cause troubles. When IO is added, the remote setup will have to be changed to reflect the additional IO in the slave rack.
- ❑ IO counts may be more than physical points on the card. Please refer to the user manual for the cards' IO consumption. Example: D2-04TRS has only 4 output points, but will consume 8 IO in your IO count. A D2-12TA has only 12 output points, but will consume 16 IO in your IO count. Analog in a Terminator rack will consume 8 or 16 WORDS, so a T1F-16DA-1 module will consume 512 IO in your IO count. Analog in Terminator will max out your masters IO capabilities fast, so please be careful. (Only the Terminator maps analog to complete words)
- ❑ Remote IO will never show up on the configure IO screen. Configure IO is only for local and expansion racks, slave racks are considered 'dumb IO' therefore, the CPU only knows what you tell it is in the slave rack.

WIRING YOUR REMOTE IO

Following these guidelines for wiring should answer any questions, and if you follow them, will make connection easier. Please keep in mind, most of these are manufacturer specs, not suggestions, so please follow them.

- ❑ When wiring your slave configuration, you **MUST** use a daisy chain configuration. Begin with the master, to slave, then daisy chain to next slave etc. *You CANNOT wire in a star configuration* going from master to two different directions to slaves. If this is required, you will need multiple masters, one to each direction.
- ❑ You can address slaves out of order. You may address the first physical slave in the wiring configuration slave 3, and then next one slave 1 etc by selecting the rotary address switches on the slaves. However, when you setup in your ladder - the IO count for slave 1, it must be the slave-addressed slave 1, not the first physical drop on the wiring configuration.



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- ❑ Wiring must be what we spec in our manuals: Belden 9841 or equivalent. Refer to Belden for the complete spec of their 9841 cable. This is important, because other cables will cause problems when installed. 16ga shielded wire will not work, A-B Blue Hose *WILL* cause problems. Just because the cable already exists, or it worked on other brand of PLC remote IO does not mean it will work for our KOYO specs. If you are experiencing link problems, or communication problems, or IO dropping, investigate your communications wiring.
- ❑ Wiring *MUST* be run in RIGID conduit alone. We suggest against running communications for remote with voltage lines whether high or low voltage. This will cause unexpected control of your IO in the slave. We suggest against using any terminal connections in your communications wiring, these only act as antennas and will increase your chances of frequency interference. Using rotating communication couplers i.e. slip rings (Comm passes through carbon brushes to achieve communications to a rotating platform) can also cause problems with communications, and result in hardware failures.
- ❑ We do not suggest using remote modems (wireless or not) for remote IO communications. We suggest using spec cable and hardwiring direct from master to slaves. (Belden 9841 or equivalent)

TROUBLESHOOTING:

If you experience problems or errors after you have installed your equipment, here are some suggested tips. If you are experiencing problems, please try these tips before calling for technical support. Automation Direct technical support is going to ask you to perform these tips before we can determine the problem.

The link lights and IO lights on master and slave modules will give you some sort indication, but they are not always 100% correct as the manual states.

- ❑ Link error = problems with communications layout/wiring.
- ❑ IO error = problems with setup code.
- ❑ Parity = hardware failure, or noise on the communications line.
- ❑ Most of the time, setup code is the problem. If one instruction is incorrect, the system will not run.
- ❑ After you have checked all wiring and layout, and you have checked the setup code, next are the dipswitches on the master/slaves. (If using CPU as master, there are no dips) Check these settings and compare them to the user manuals.
- ❑ Once you feel confident that everything is correct, but yet the system will not run. Here are 3 key tips:

CLEAR SYSTEM V MEMORY AND VARIABLE MEMORY

INITIALIZE THE SCRATCH PAD

If using 205 RMSM OR RSSS module: RUN DIAGNOSTICS (Turn on the last dip switch on master and slave power up for 5 seconds, then power down and turn these dip switches back off).



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- ❑ If you have repeated hardware failures on either the master or slave communications, most likely there are noise issues in your application. If you cannot isolate the noise, or fix the problem, we suggest using a Comm filter at every connection (master and slaves). We have tested and recommended one made by B&B electronics: HESP4DR. These are 485/422 Comm filters. You can find B&B Electronics @ <http://www.bb-elec.com> they also have an international site in case you are outside of the U.S.
- ❑ If you are using DC powered bases, and are experiencing problems, Isolate the base power supply from your IO power supply. We have seen too many times applications that use one large DC supply for all IO and rack power, and spikes from inductive loads either cause communications to drop, or damage communication slave cards.

Technical

Assistance: If you have questions regarding this Application Note, please contact us at 770-844-4200 for further assistance.