

MV-90 Meter Communications Issues and Best Practices

Revenue Metering Sub-Committee Meeting

March 8, 2006

Dave Wilkinson



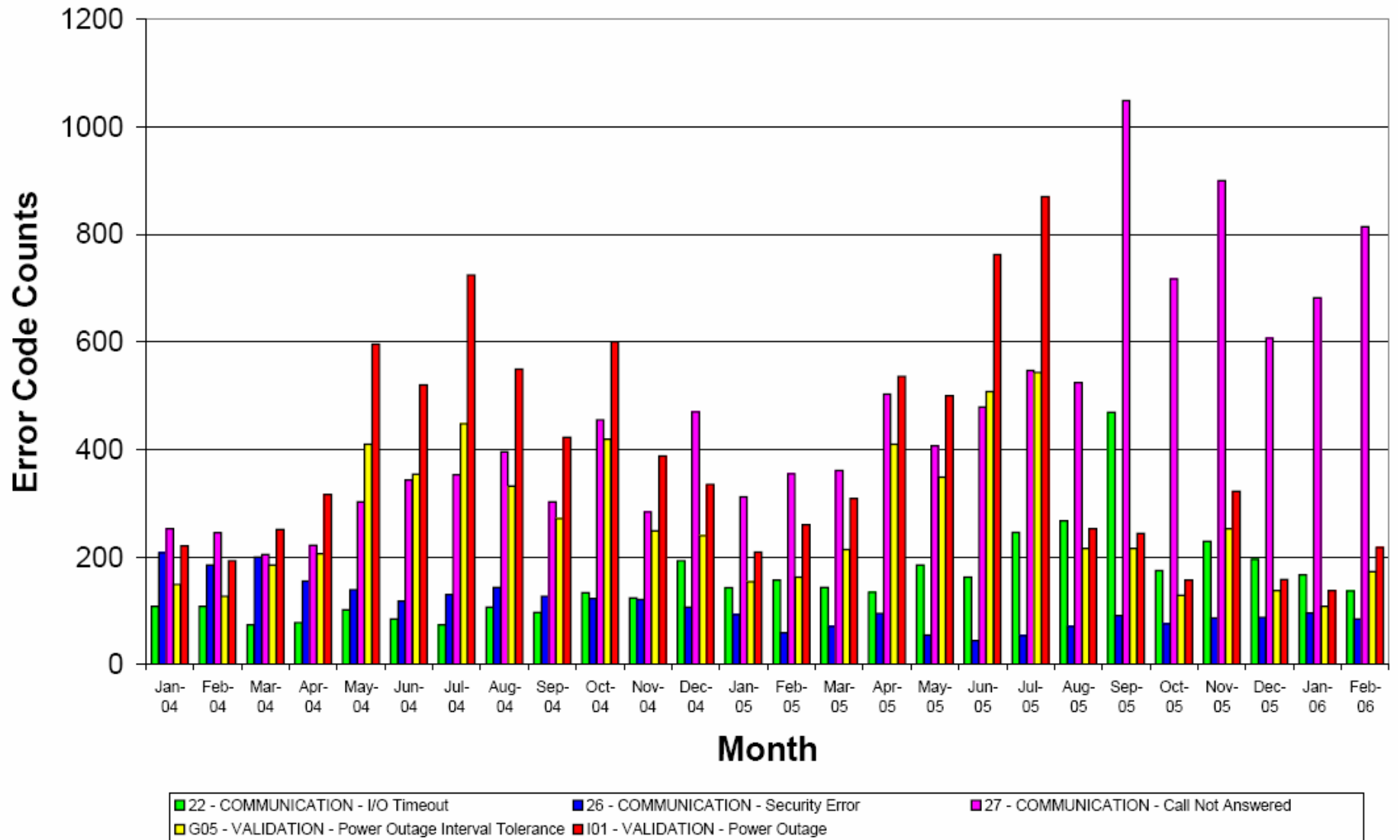
- q Communication MTRs**
- q Recent IESO MV-90 system changes and events**
- q Initiatives to improve IESO's MV-90 daily calling success rate**
- q Modem research and issues**
- q Meter communication system design suggestions to improve daily calling success rate**
- q IESO's MV-90 Call Window – Exclusive Access**
- q Questions and discussion**

q Top 3 Communication MTR codes are:

MTR Error Code	Error Code Description	Average Per Working Day
27	Call Not Answered	23
22	I/O Timeout	8
26	Security Error	5

q IESO staff monitor MV-90 communications daily

Monthly Summary of MTR Error Codes Included in Externally Issued MTRs - Top 5 Categories Only



q Communication Working Group meets biweekly

- Review communication performance statistics / trends
 - ü Repeat Offenders list and related issues
- Analyze MV-90 settings and configuration
 - ü Call Cycles – Management and scheduling
 - ü Forced call failures – automatic estimation during meter deregistration process
 - ü Retry strategy and retry time delay settings
- MV-90 Hardware
 - ü Modem configuration issues and testing
- MV-90 Infrastructure
 - ü PBX operational reliability – correlation with MV-90 calling errors
 - ü Direct lines investigation and testing results
- MV-90 TIM Updates
- MV-90 Test System Issues
 - ü Migration to MV-90 xi

- q **IESO upgraded MV-Comm calling stations 2005-09-11**
 - New PC hardware and increase from 3 MV-Comm stations (48 lines) to 4 MV-Comm stations (64 lines)
 - Replace 50% of legacy US Robotics “Total Control” (equivalent to USR V-Everything) modems to Digi RAS8 integrated card modems
 - ü Increased daily Communication MTRs
 - ü IESO worked with MSPs in September and October to refine dial strings
 - ü Daily Communication MTRs reduced but not to levels prior to 2005-09-11

- q **IESO MV-90 failover test to backup MV-90 system on 2005-11-16**
 - Unacceptable number of Communication Failures
 - ü First failover test since conversion from 3 to 4 MV-Comm stations
 - ü Root cause was inadequate number of telephone circuits at backup location to support additional MV-Comm station

Initiatives to Improve Daily MV-90 Calling Success Rate

- q Telephone number formatting changes
 - Leading “,9,”
 - Use of two fields to store dial string
- q Modem research project
- q Additional modem calling capacity
- q Forced modem segregation by meter type (TIM)
- q Analysis of telephone Line Sharing Device performance issues
- q Reduction in call collision with other MV-90 users’ call attempts to RWMs

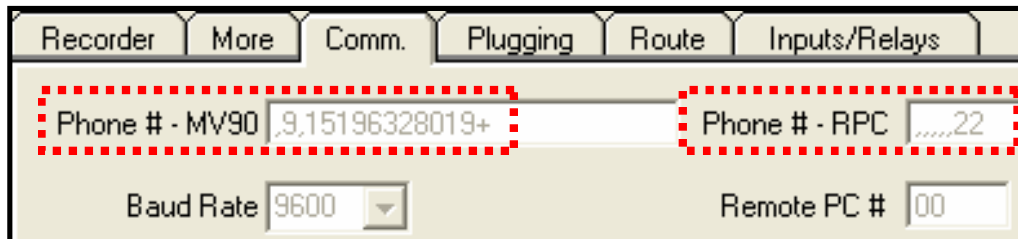
Introduction of Leading Delays in the Dial String – “,9,”

- q **Analysis of load on IESO PBX system during MV-90 call initiation**
 - Initial burst of outbound call traffic has negative impact on call success rate
 - Telephone system goes from being idle to immediate request for 64 outbound lines
 - On 2005-11-29 we changed our default dial string in MV-90 for all MP IDs to include a prefix of “,9,” to allow time (2 periods of 2 seconds) for PBX system to settle and acquire outside line dial tone
 - No major improvements in call success rate directly related to this change
 - However, the additional delay time provides more margin to allow for unexpected and intermittent delays on both IESO’s PBX and the public telephone system

- q **Recognition of inconsistent timing of public telephone system**
 - More attention to detail required for installations using line sharing devices
 - Multiple occurrences of transfer code sequence required in many cases to allow for “slow” days on public telephone / cell network(s)

New Two Field Telephone Number Formatting Standard in MV-90

- q Adoption of new two field formatting standard for storing telephone numbers in MV-90 master files



Recorder | More | Comm. | Plugging | Route | Inputs/Relays

Phone # - MV90 .9,15196328019+ Phone # - RPC22

Baud Rate 9600 Remote PC # 00



Metering Installation Registration Tool

File Help

Customer Information | Recorder Information | Recorder Remote Interrogation

Recorder ID Location

Device Type

Local Phone No. .9,15196328019+

Remote Phone No.22 ID of Mast

- q In conjunction with the introduction of the leading “,9,” sequence, we have reformatted our MV-90 data base as follows:

- ü “Phone # - MV90” field (“**Local Phone No.**” field in MIRT tool)
 - stores only the characters required to acquire dial tone and the base public telephone number (including long distance character(s) where required) and the “+” symbol where needed to instruct MV-90 to take the balance of the dial string from the “Phone# - RPC field”
- ü “Phone # - RPC” field (“**Remote Phone No.**” field in MIRT tool)
 - stores all characters used to control call transfers via either automated telephone attendants, telephone line sharing devices, etc.

Benefits of Two Field Telephone Number Formatting Standard

- q **Allows IESO staff to analyze MV-90 Master file entries for uniformity across a single telephone number**
- q **At time of meter registration, IESO staff will verify that no more than 4 MP IDs use the same base telephone number**
 - **Ensures compliance with 4 Call Cycle design criteria, especially for sites where multiple MP IDs sharing the same telephone number are registered at different times**
 - **Where more than 4 meters are designed to use the same telephone number, Daisy Chain strategies with individual chain depths of **3** or less must be used**

- q IESO staff have studied the features of our modems
- q Legacy Modems – Total Control (TC) = US Robotics chip set
- q “New” Digi RAS8 Modems = Rockwell chip set
 - New modems work well with most Conforming meters but are less effective at and below 2400 baud

- q IESO MV-90 System Configuration Change
 - 2005-09-11 change introduced 2 types of modems
 - Legacy MP IDs assigned to original modems
 - Conforming MP IDs assigned to new modems
 - Possibility of some Conforming MP IDs using both old and new modems
 - ü Result was intermittent failures on Conforming meters due to MV-90 retrying failed calls on combination of modem types

Additional Modem Calling Capacity Installed

- q Analysis of typical download times by meter model showed we needed more calling capacity for Conforming Main meters
- q IESO staff initiated a project to replace 16 of the legacy Total Control modems with Digi RAS8 modems

Meter Type	1 Day Call Duration [Min.]
PSI S100	1.75
PSI S200	1.25
ION 8x00	5.0
Q1000	4.0
Alpha Plus	2.5
Sentinel	1.5
kV2/kV2c	2.5

Modem Assignment Changes

- q We recognized additional modem capacity was required to ensure all calls were completed before 05:30 EST each day
 - On 2006-01-26 we replaced 16 of the legacy Total Control modems with 16 new Digi RAS8 modems
 - At the same time, we forced all Conforming Meters to use ONLY the Digi RAS8 modems on ALL call attempts
 - Result was initial doubling of Communication MTRs
- q On 2006-02-02 we attempted to make the new Digi modems function like the legacy TC modems using an initialization string
 - Result was a five fold increase in Communication MTRs
- q On 2006-02-03 we restored the original modem initialization strings for all modems
- q From 2006-02-03 to 2006-02-17
 - Failed calls reviewed daily and we selectively “steered” future calls for Conforming meters that failed to connect using the new Digi RAS8 modems to the legacy TC modems

What Have We Learned So Far?

- q **Murphy's law is alive and well!**
- q **The legacy Total Control modems and the Digi RAS8 modems are fundamentally different devices**
- q **Additional testing and research is required to configure the Digi RAS8 modems to make them operate with MV-90 as similar as possible to the legacy Total Control Modems**
- q **Possible additional underlying issues with PBX require additional investigation to confirm**
- q **Plan to continue testing Direct Analogue Telephone lines to confirm difference in MV-90 call success rate**

q Telephone Line Sharing Device Issues

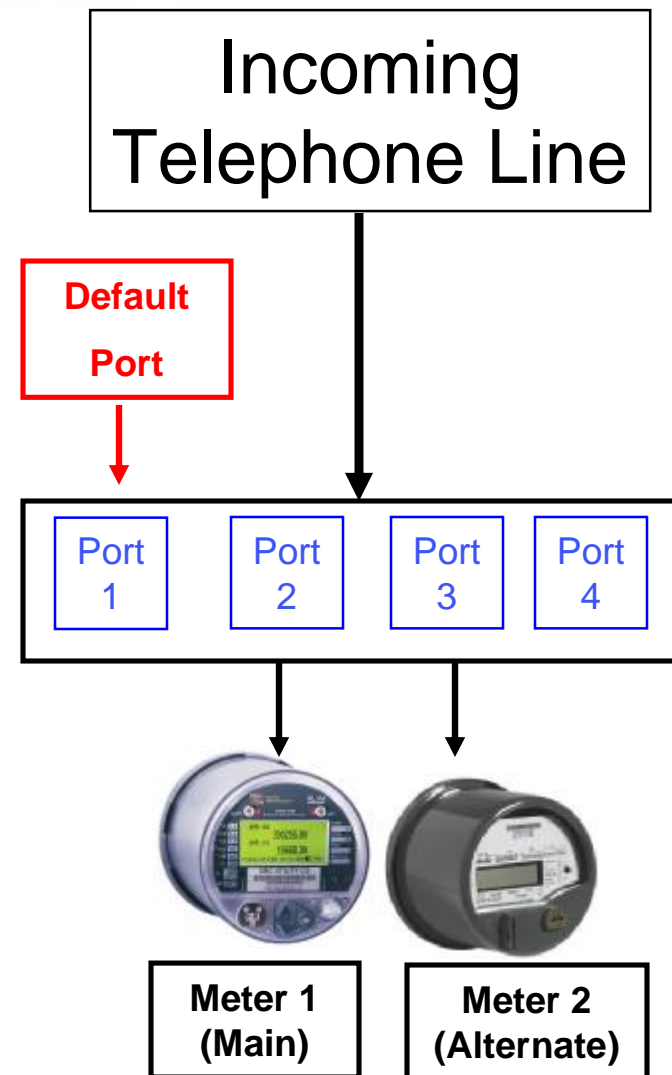
- Design Considerations
- Hardening Strategies for “challenging” sites

q ION Meter Programming Choices

- Tips for preventing MV-90’s **“Hello Wrong Meter”**
typical MV-90 Error Return Codes
 - ü 10 – Device ID Mismatch
 - ü 26 – Security Error
 - ü 22 – I/O Timeout Error
 - ü 24 – Protocol Error

Telephone Line Sharing Devices

- q **Basic multiplexing switch to allow one telephone line to service multiple meters**
- q **Common brands are:**
 - “The Stick (1)” – “.,*2” or “*3,”
 - “The Stick (2)” – “.,22” or “.,33”
 - LSDI – “.,22” or “.,33”
 - Polenet ACP – “.,22” or “.,33”
 - Teltone – normally “.,22” etc.
 - **Black Box**



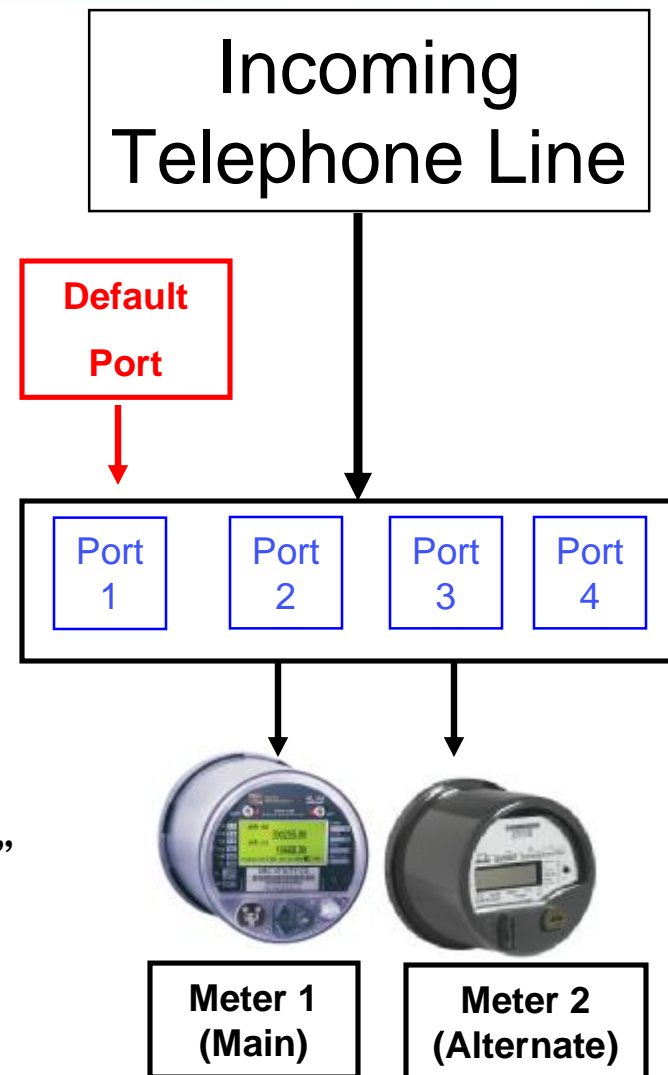
Known Issues with Telephone Line Sharing Devices (1)

q Default Port Issues

- Incorrect dial string timing may send calls to the default port
- **DO NOT** connect meter modems (or anything else) to the default port
- Unexpected answering of a misdirected call results in MV-90 Communication errors which often defeat MV-90 retries
- Specify Line Sharing Devices for supporting **N** meters that have at least **(N+1)** ports

q Use multiple occurrences of the correct transfer code sequence

- Bell system may be intermittently slow
- Use “,,22,,22” rather than a single “,,22”
- Minimum 2 comma separation between occurrences recommended by line sharing device manufacturers



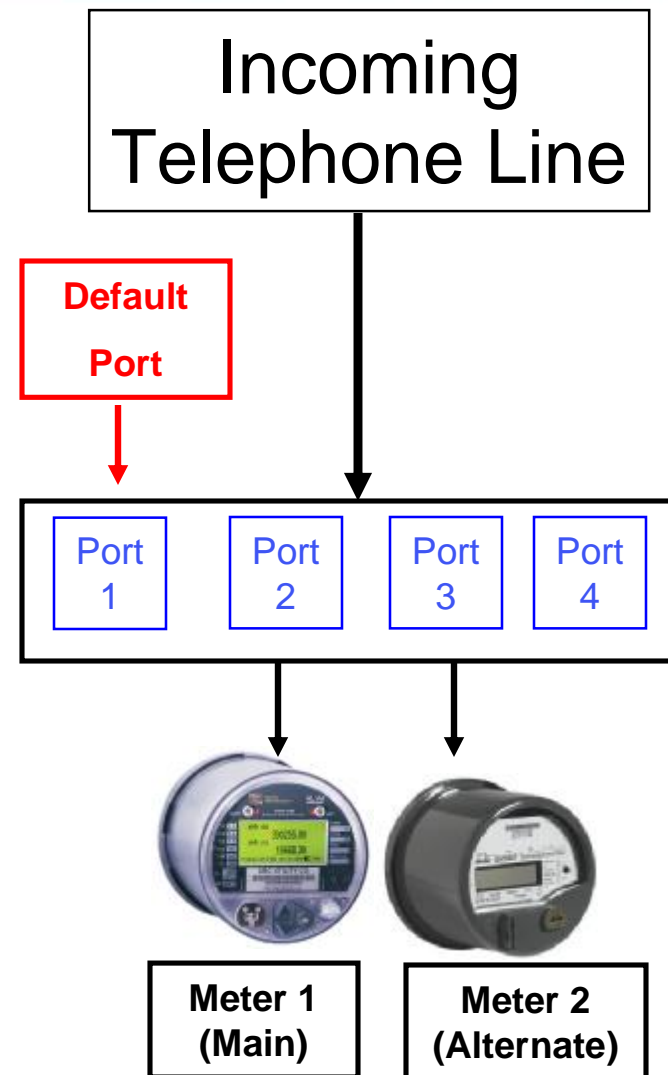
q Extract from “The Stick” owners manual

Rings To Answer-This feature directs The Stick to answer an inbound call after a programmed number of rings (0 to 10 rings) from the phone company. If RTA is programmed to “0”, The Stick will answer the call during the first ring. Extension phones elsewhere in your location will only “chirp” the first ring before going quiet. If the RTA is greater than “0” The Stick will allow all incoming calls to ring extensions and devices connected to the ports labeled VOICE 1 and VOICE 2 for the programmed number of rings. Factory preset is 0 rings.

- q Devices connected to “Voice 1” and “Voice 2” will experience “Chirp” when incoming calls are answered by “The Stick”
- q This may cause sensitive modems to initiate answer attempt and create an MV-90 **“Hello Wrong Meter”** Error Return code

Known Issues with Telephone Line Sharing Devices (2)

- q Expect Ring Signal **“Leakage”**
- Most models will leak some ring signal to one or more unintended ports during a call transfer – “Chirp” phenomena
 - **DO NOT** program the meter’s modem to answer on the first ring (typically the meter manufacturer’s default setting)
 - Program the meter’s modem to answer **AFTER 3 rings**
 - ü Prevents unintended “wake up” of the wrong modem/meter during initial “Chirp” of leaked ring signal
 - Most meter vendors allow you to modify the internal modem’s answer ring delay without breaking the seal

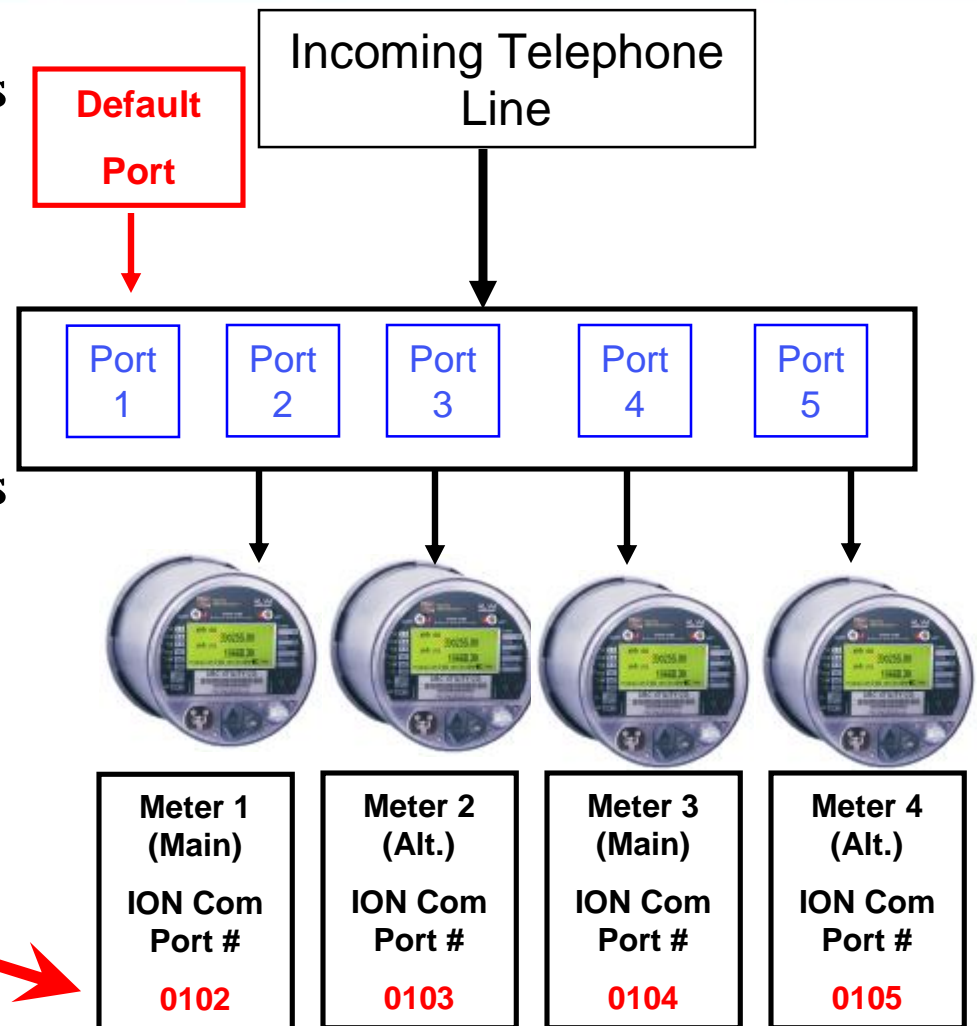


Known Issues with Telephone Line Sharing Devices and ION Meters

- q MV-90 Communicates with a ***SPECIFIC*** ION Com Port Address Number rather than the Device ID (TAG2) field !!!
- q Each MV-90 Call **must** match the right most 4 characters of the Recorder Master File's "Phone Password 2" field with the ***SPECIFIC*** ION Com Port Address Number on the answering ION meter
- q Recommendations:

- Ensure multiple ION meters connected to the same telephone line sharing device have:

- ü **Unique** ION Comm Port address numbers – default = "0101"
- ü **Unique** Password 1 field entries



MV-90 Gets A “Hello Wrong Meter” Error ... Now What Do I Do?

- q Analyze multiple same site / MP ID
Communication MTRs for call failure patterns
- q IESO is developing a legend of MV-90
Communication Log Error Return Codes for
conforming meters to identify known issues and
assist with trouble shooting by MSPs, MMPs and
IESO staff
- q Make good design choices using all “Learning to
Date” on new meter installations to screen out the
number of misdirected MV-90 call attempts going
forward

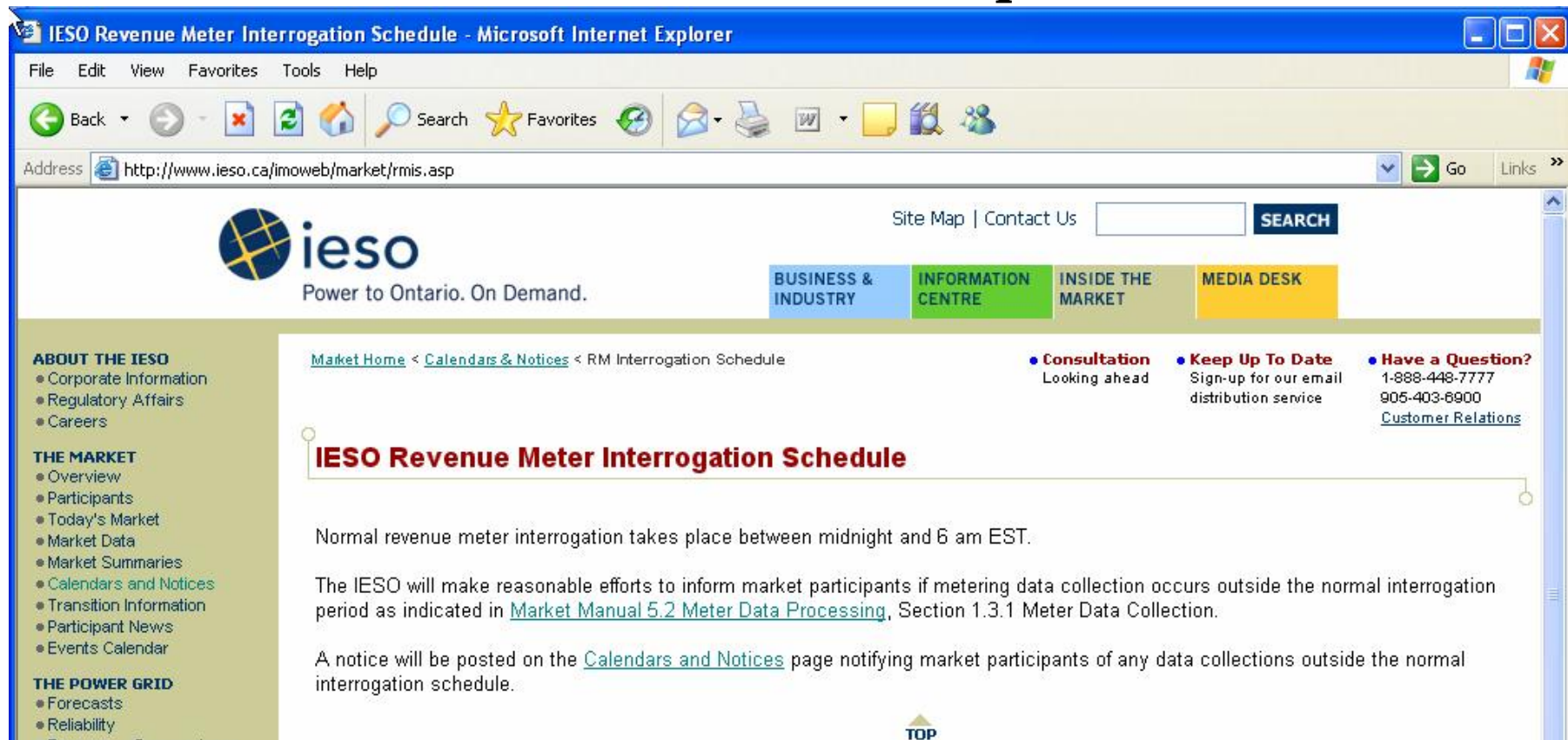
<i>MV-90 Communication Error Return Codes - IESO Conforming Meters</i>							
Error Number	Error Code	MV-90 Ready Status	Power Measurements ION	Iron (Schlumberger) Q1000	ABB Alpha Plus	Iron (Schlumberger) Sentinel	GE KV2/KV2c
01	TIM - OTHER ERROR	DISABLED	MV90 Mascartile configuration does not match the meter configuration. i.e.: # of channels.	<p>1. The MV90 Password #1 field is neither Read/Write or Read Only password of the meter.</p> <p>2. Attempting to perform a WRITE DATE/TIME function with the Read Only password.</p> <p>3. MV90 Mascartile configuration does not match the meter configuration. i.e.: # of channels, units, etc.</p> <p>4. The MV90 Reader Password does not match the Q1000 Meter Address. This field is to contain the Q1000 Meter Address for the meters port that is used for communicating to the IESO's MV90 system.</p>			
07	TIM - RECORDER CONFIGURATION DOES NOT MATCH TIM BLOCK CONFIGURATION	DISABLED		<p>The MV90 UNIT ADDRESS field is incorrect. The UNIT ADDRESS field defines the Q1000 load profile configuration that MV90 will retrieve. In this particular case, the MV90 system was attempting to retrieve a load profile configuration that was not configured in the meter. As per the IESO Q1000 Framework, load profile configuration #1 is the revenue billing profile. The UNIT ADDRESS field must be blank or set to 1 to retrieve this load profile.</p>	MV90 Mascartile configuration does not match the meter configuration. i.e.: # of channels, units, etc.		
08	TIM - INVALID TIM PARAMETER	DISABLED	Entry in Password 1 field > 8 characters.				
09	TIM - TIME DIFF. OUT OF BOUNDS	DISABLED					
10	TIM - ID MISMATCH	DISABLED	The MV90 Device ID field does not match the ION Factory_Module.TAG2.	The MV90 Device ID field does not match the Q1000 UnitID.		The MV90 Device ID field does not match the Sentinel UnitID.	The MV90 Device ID field does not match the KV2/KV2c Meter ID.
21	COMMUNICATIONS - OTHER ERROR	ENABLED					

Preventing MV-90 Call Collision

- q IESO requires **exclusive access** to all RWMs between **00:01 and 06:00** EST
- q Market Rule, Chapter 6, Section 3.1.1.3 includes the following MMP Obligation:

coordinate electronic access, by persons other than the *IESO*, to each *metering installation* in respect of which it is the *metered market participant* so as to prevent such persons from accessing the *metering installation* at a time or in a manner that may adversely affect the ability of the *IESO* to access the *metering data* in that *metering installation* in accordance with the notice given pursuant to section 8.1.7.
- q MSPs and their MMPs who need to call their RWMs must ensure they do so **outside of this calling window** to minimize call collision – Error Return Code 27!

q Please remind your associated MDMA(s) and MMP(s) MV-90 staff of this requirement



IESO Revenue Meter Interrogation Schedule - Microsoft Internet Explorer

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IESO Revenue Meter Interrogation Schedule

Normal revenue meter interrogation takes place between midnight and 6 am EST.

The IESO will make reasonable efforts to inform market participants if metering data collection occurs outside the normal interrogation period as indicated in [Market Manual 5.2 Meter Data Processing](#), Section 1.3.1 Meter Data Collection.

A notice will be posted on the [Calendars and Notices](#) page notifying market participants of any data collections outside the normal interrogation schedule.

TOP

